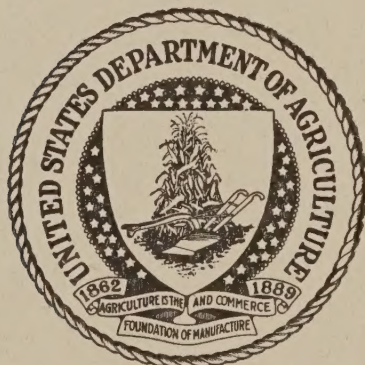


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SOIL CONSERVATION

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The facts and the figures that prove soil conservation measures make yields and make money—A Minnesota experiment in maintenance of State highways, so important to war use—A spunky Iowan at work on his Victory farm—Meet them all in this timely issue

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WELLINGTON BRINK
EDITOR

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SOIL CONSERVATION



CLAUDE R. WICKARD
SECRETARY OF AGRICULTURE

526647
HUGH H. BENNETT
CHIEF, SOIL CONSERVATION SERVICE

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CONSERVATION PAYS OFF IN THE PLAINS COUNTRY

By H. H. FINNELL¹

An occasional critic writes us, tells us, or publicly proclaims, in all sincerity, that in his opinion the per acre cost of soil conservation achieved through the program of the Soil Conservation Service is too high. It seems to me that such criticism is in some degree refuted by the fact that farmers everywhere—the great majority of them, both those who have adopted the program on their own land and those who have seen the work in open fields in every step of its progress, as well as the results—want more and more of it on their farms. A further indication of the practicality of soil conservation practices—not forgetting cost—is the fact that within less than 5 years something over 2 million farmers, on their own initiative and of their own volition, have organized under State laws 736 soil conservation districts, comprising approximately 432 million acres of land in 41 States, and all of them have asked the Service's help in setting up and carrying through their conservation farming programs.

Farmers, I think, do not go in for matters of this nature until they have completely convinced themselves that what they are asking for—and are getting in most of the States, through huge majorities in referenda of the democratic type—is sound from the practical, scientific, economic, and social angles.

Still further evidence of the basic soundness of the program is found in the action of 139 of the districts: these districts, after actual experience with the work of the program, and at the request of neighboring farmers have voted or legally arranged for enlargement of the size of their areas. Some 42 million acres were added to districts in this manner in 25 States in approximately 4 years. One district in Nebraska has been extended through 25 separate petitions of neighboring farmers and has increased in size from 62,185 acres to 287,112 acres.

Perhaps the mere word "conservation"—a good, solid word—has kept many friends of the Service from faltering in their faith in the program. Others have undertaken to justify the expense by emphasizing the experimental character of the work or the excessive effort required to overcome the inertia so commonly encountered in getting a thoroughly new program under way. Other causes of what some have felt were excessive expenditures have involved the diffi-

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culties of establishing and maintaining working relations with other agencies, and with the necessity of training technicians to pool their respective skills for effective application of a program that calls for coordination of various types of practical and scientific knowledge into a single working tool.

Then, too, there was in the earlier days of the Service the necessity for making use of large amounts of relief labor without always having time for adequate planning.

But these in a sense are things of the past. The Soil Conservation Service now has arrived at that stage of progress where it is definitely known that the costs to the Federal Government for soil conservation work in the Southern Great Plains region—the “Dust Bowl,” so-called—are more than offset by the accumulated benefits to the land and land operators. Nor has this any reference to intangibles or benefits hoped for in the future, but only to work accomplished and benefits duly received.

The program, it must be pointed out, has been helped directly or indirectly by other agencies, such as the Extension Service and the AAA. Without such help the results might not have been nearly so good.

Even the mistakes that have been made have served for the most part as guides to subsequent operation, to such an extent that many of them probably have done more good than harm. Thus we can now burn the mortgage and begin planning for the expansion that is justified by profitable results already produced.

Table 1 presents the progressive results of 8 years of soil and water conservation work carried out in the Southern Plains: the dollar returns from dollar investments, based on actual accounts and records and on careful evaluation of results, except for 1942 which is estimated on the basis of work so far accomplished.

TABLE 1.—Accumulated expenditures and production of plans, completions, and benefits in the Southern Great Plains Region (estimated for 1942)

Year	Regular appropriations	Detailed farm plans	Combined treatment completed	Benefits returned ¹
	<i>Thousands of dollars</i>	<i>Thousands of acres</i>	<i>Thousands of acres</i>	<i>Thousands of dollars</i>
1935-----	60	29	17	13
1936-----	1,439	232	137	117
1937-----	3,041	896	528	518
1938-----	4,398	1,482	874	1,181
1939-----	6,234	4,313	2,544	3,112
1940-----	7,976	6,508	3,840	6,026
1941-----	9,289	10,234	5,821	10,444
1942-----	10,890	13,134	7,749	16,326

¹ Increased production resulting from conservation of rainfall, maintenance of normal production, and maintenance of capital value—the soil.

In substance this record shows that while the first year's expenditures under the Soil Conservation Service program for the Southern Plains area exceeded the benefits by 4.6 times, the accumulated costs were very much more than balanced by the seventh year and promise to be exceeded by nearly 50 percent in the eighth year.

A private industry operating on such a rate of returns on its investment would be criticized for profiteering. It is idle to speculate as to how long it will be until the taxes alone, from the rapidly mounting accumulation of benefits, will be sufficient to keep the Soil Conservation Service in operation and yield surplus revenues which may be applied to the retirement of the public debt. Nevertheless, the possibilities of expansion of this margin of profit might conceivably go on until all soil and water resources have been developed to their highest productive efficiency commensurate with permanent maintenance. In the Southern Great Plains Region, combined treatment of land could be completed 10 times as fast as it is now being done and still leave 5 or 6 years of detailed planning work yet to be done.

The potential net annual return from soil and water conservation work in the whole of the Southern Great Plains Region is computed at 97.9 million dollars. This means that if and when a detailed conservation program has been completed on all the land in the region, the current net profits on con-

TABLE 2.—Analysis of farm planning and treatment in Southern Great Plains Region, including estimated costs and benefits. (Calculated from data reported from seven offices for the calendar year 1981 ¹)

	Denver	Pueblo	Salina	Dodge City	Clovis	Perryton	Lubbock	Total for region
Farm plans	288	288	1,084	246	281	140	323	2,650
Acres planned	366,427	817,249	250,570	110,302	521,780	291,082	296,348	2,653,758
Acres—combined treatment	281,854	344,734	138,712	145,233	391,551	366,748	331,239	2,000,071
Technical hours	84,733	54,659	212,347	72,814	63,133	64,191	114,915	666,792
Minutes per acre completed	18.0	9.5	91.8	30.1	9.7	10.5	20.8	20.0
Planning and treatment cost per acre	\$0.469	\$0.194	\$1.889	\$0.997	\$0.256	\$0.331	\$0.615	\$0.52
Total cost for planning and treatment completed	\$132,190	\$66,878	\$262,027	\$144,797	\$100,237	\$121,394	\$203,712	\$1,031,235
Percent of range land	69.0	85.7	48.4	29.4	79.1	76.0	61.0	69.5
Percent of crop land	29.8	13.1	48.0	69.6	20.3	23.0	38.0	29.3
Percent of other land	1.2	1.2	3.6	1.0	0.6	1.0	1.0	1.0
Average annual benefits per acre—range land	\$0.094	\$0.05	\$0.24	\$0.20	\$0.14	\$0.14	\$0.14	\$0.12
Average annual benefits per acre—crop land	\$1.88	\$1.10	\$3.80	\$2.37	\$1.88	\$2.65	\$2.65	\$2.40
Estimated total annual benefits for planning and treatment completed	\$176,186	\$64,448	\$269,124	\$248,104	\$192,792	\$262,555	\$361,846	\$1,575,055
Ratio of benefits to cost	1.33:1	.96:1	1.03:1	1.71:1	1.92:1	2.16:1	1.78:1	1.53:1

¹ LU data have been omitted from this analysis.

servation work will approximate 97.9 million dollars a year. The actual money in the pockets of farmers and ranchers who have completed conservation work in the region is estimated at 5.9 million dollars during the calendar year 1942.

This means that the job is about 6 percent completed. If a 6 percent completion of the total job to be done in the Southern Great Plains Region is capable, as it has proved to be, of returning sufficient benefits at the end of 7 years to pay off the Federal cost, then certainly a greater investment and a more rapid rate of accomplishment can be justified both from the economic and public interest point of view.

Summing up the work of the region, including 1942, the regular appropriations spent by the Federal Government during the 8 years of Soil Conservation Service activity amount to approximately \$10,890,000. The total accumulated net profits to landowners and operators, resulting from the Service program during the same period, are estimated at approximately \$16,326 000, exceeding the Federal cost by 5.4 million.

To our critics we can now say: Soil conservation is not an uncertain investment; it is not even a financial risk. Soil conservation is an investment in the future only in part; it is an investment in the future which more than pays its way as it goes. Often benefits exceed the cost the first year, although this is more frequently the result in areas of higher rainfall.

Many well-meant suggestions have been voiced along the line that savings should be made by disregarding certain problems or by arbitrarily eliminating certain phases of work. Individual cases show that incompleteness and lack of thoroughness are the most common causes of failure of conservation plans.

Results obtained by adhering to a complete program—treating whole farms with all available measures economically and properly coordinated to meet the needs and adaptabilities of all the lands of each farm—have proved that what we needed was not to know how to make a bad investment worse by lowering the quality of work done, but how to make a good investment better by perfecting yet higher standards for the quality of work done. The Soil Conservation Service program does not need to be streamlined. If anything needs streamlining, it is our procedures. What we are doing is all right; how we go about it might be improved.

I shall have to admit that I was very much upset when I first discovered that in one area of the Southern Plains Region the technical time expended per acre of combined treatment completed amounted to only 9.5 minutes, while in another area of the same region 91.8 minutes were spent on an area of the same size. Had there been a glaring discrepancy in the efficiency of personnel? Or was the difference due to the quality of the work done? Analysis of the question, however, has shown that when all the elements are evaluated the discrepancy is more apparent than real.

The study substantiates the contention that regardless of land values, regardless of the seriousness of the erosion problem, regardless of the differences in efficiency which normally exist between employees, and regardless of the intensity of land use, a high quality, completely detailed, adequately coordinated and permanent program of soil and water conservation is *worth what it costs and more*.

The 1941 work year for the Southern Great Plains Region (Region 6) is summarized by areas in table 2.

(Continued on page 6)

SEVEN YEARS OLD, AND A WAR JOB TO DO

Seven years old, goin' on eight!

Like many another sturdy American lad, *Soil Conservation* is pretty much stirred up about the war, and determined to lend a hand toward its winning.

Having now attained the long-pants maturity of Volume VIII, the magazine proudly elects to lop off its cuffs. There will, in consequence, be somewhat fewer pages per issue in the future. Each page will carry a bit bigger load of type, margin waste being eliminated. Numbers of other changes will be effected, most of them less noticeable. It all adds up to appreciable savings in paper and other items. The physical economies are a reflection of the magazine's intent to continue alert, timely, vital.

Readers of *Soil Conservation* may as well make up their minds to see a lot of our American flag henceforth, for it is due to grace the front of the magazine for many months to come. To my mind, Old Glory constitutes the most comprehensive, inspiring and worthy emblem available to our working democracy—whether it flies from the prow of a destroyer or from the ramparts of an aroused agriculture. (To achieve his dramatic rendition of an admittedly difficult subject, Artist Simmons obtained a flag and studied its action in a breeze.)

Uhland's article in May, Enlow's and Lowdermilk's articles in June, Finnell's and Loyd's noteworthy contributions to this issue are fair foretastes of the editorial lines which *Soil Conservation* intends to pursue for the duration. Truly, "the flag is on the plow"—and it is likewise on *Soil Conservation*.

—WELLINGTON BRINK, *Editor*.

(Continued from page 5)

When the amount of range land compared to cultivated land and the actual increases in production accomplished by conservation work are taken into consideration, it is revealed that the results produced are actually in keeping with the expenditure of technical hours per acre. Annual benefits to range land vary between 5 and 24 cents per acre, while those of cultivated lands vary between \$1.10 and \$3.80 per acre. In general, these variations in the value of a program are in line with the technical hours spent by the Service in getting a program completed.

Nearly 10 times as much time was spent by technicians for each acre planned in eastern Kansas as was spent in eastern New Mexico. The cost of planning and treatment per acre, however, was only about 7 times as much. The first year's benefits exceed the cost to the government both in eastern Kansas and in eastern New Mexico. Most differences in ratios of cost to benefits can be explained largely by the variation in natural conditions which determine the potential limits of improvement in land and water utilization.

Estimates of annual benefits in all cases are based on research and evaluation studies rather than on farmer opinion, although farmer opinion strongly substantiates the conclusions reached. The results, in terms of immediate income, show that both the government and the farmer are justified in spending nearly 10 times as much per acre in eastern Kansas as in south eastern Colorado. This is according to the needs and adaptabilities of the land. It is not because it costs more to complete the job, but be-

cause it is worth more. All costs either in high-cost or low-cost areas are usually paid off in immediate or early returns. In other words, *conservation is worth what it costs and more.*

We should not boast of the fact that, in spite of amateurishness, inconsistency, waste, and lost motion, the soil conservation program has paid out. But a thing we can be proud of, and the thing which should be utilized to the fullest extent is the fact that the physical and economic effectiveness of the technical program has been proved. In so doing, we have revealed an undeveloped productive potential which is available for increased war production. This fact should urge us forward to gain the mastery more quickly of all our agricultural and land use problems, so that agriculture can be sure of doing its expected part in the war.

Conservation of farm labor in time of war is no less important than conservation of the soil. Farm accidents in the United States claim a substantial part of farm income and more than 4,200 human lives each year. Every farmer should learn how to reduce hazards on his farm.

Watch that fire! Some 3,500 persons are burned to death in fires on farms and in rural communities each year; the loss runs to about \$200,000,000. Forest and grass fires take an enormous toll in property damage. Along with safeguarding the soil, throw out added protection against farm fires. These are days when we cannot afford to waste soils, farm property, or manpower.

Total war means utilization of every available resource. The ideal, speaking in terms of agriculture, is to obtain the maximum productive efficiency from every acre, every tree, every machine, every drop of water, every pound of fertilizer, every animal, every farmer and his family. This ideal is coupled with the ideal of protecting the soil resource so that after the war the land will still be productive and fully capable of meeting the continuing needs of a great and prosperous people.

STREAMLINING CUTS WARTIME UPKEEP

By GLENNON LOYD¹

Concrete slabs throb under their wartime load. Indispensable food rushes to market over rural byways. Rumbling trucks form the inseparable right arm of the Nation's long haul to victory. Joyrides are out of fashion, gasoline rationing prevails in the East, and declining income from gasoline taxes already reflect the shrinkage of nonessential motor traffic.

In these circumstances county, State and Federal road officials are confronted with the difficult problem of keeping the highways in shape for the duration. They are keenly aware that fixed charges normally consume more than one-fourth of all highway income, and that as revenues drop the percentage lopped off by fixed costs rises.

With upkeep now the big problem, highway officials of Minnesota fortunately have a 5.17-mile stretch of "test tube" highway that has produced several ways of making the maintenance dollar stretch farther.

The "test tube" lies between the towns of Pine Island and Zumbrota on Highway 52, a trunk artery between Minneapolis-St. Paul and Rochester. High snow-removal costs and excessive expenditures for right-of-way maintenance were two of the factors influencing the selection of the spot for the demonstration.

The road between Pine Island and Zumbrota, which was paved in 1930, included a variety of curves, intersections, hills, cuts, and fills. By 1938, when the improvement was undertaken, there was a great deal of erosion along the slab. In some spots, soil washed from the bare slopes of cuts had filled ditches and caused frost heaves in the pavement. In other places run-off had damaged embankments and gullied drainageways.

Fertile land, moderately rolling, adjoins the demonstration, and the farmers, who went out of their way to cooperate, are engaged primarily in the production of milk, beef, pork and other victory foods.

The State Highway Department of Minnesota developed plans for the demonstration, with the Soil Conservation Service making recommendations on erosion control measures and the Bureau of Public Roads cooperating. Drainage facilities were redesigned to eliminate erosion on the road shoulders, in cuts, on fills, in roadside ditches and on adjacent farmland. Safety also was given weighted consideration as the blueprints were developed. Here was an opportunity to demonstrate effectively the safety



A masonry dam straightjackets the unruly waters spouted from a culvert.



facilities that can be incorporated in highway systems.

When the plans and specifications were completed, the State highway department provided all heavy equipment, some concrete forming, and the necessary skilled labor for grading, tilling and seeding operations. The CCC camps at Zumbrota matched this with quarry equipment, small tools and husky youths to keep them busy.

Additional right-of-way was procured, and the job of streamlining the roadways along the two-lane highway began. Ditches were widened and there was extensive mulching, seeding, and sodding. Some culverts were extended and headwalls were constructed on others that could not be raised to meet new ground levels.

Shoulders on the highway were widened to an 8- to 10-foot minimum and all surface drains were repaired from the old shoulder line to the toe of the slope to conform with the new cross-sections of the road. Also, from a safety standpoint, sight distances at curves and intersections were lengthened, slopes were flattened, ditches were filled in and widened, guard rails were eliminated and dangerous check dams in ditches were covered.

Some of the farmers donated seed for seeding operations. In return, they got improved farm entrances, protection from gully erosion along the right-of-way, and saving in maintaining fences. The

¹ Head, regional current information section, Upper Mississippi Region, Soil Conservation Service, Milwaukee, Wis.



Back slopes and side ditches here underwent a transformation—they were reshaped and seeded. Grading permitted the growth of vegetation which licked erosion.



work also provided the farmers a strip of alfalfa hay between the road shoulder and the right-of-way fence. They have been urged to harvest the strip and most of them are doing it.

Prior to the improvement, the steep slopes and embankments were expensive to mow since most of it had to be done by hand. Snow removal likewise was difficult because the sharp cuts invited deep drifts that could be cleared only with heavy plows. Likewise, more than a mile of guard rail formerly scattered along the road on shoulder embankments as a safety measure had complicated mowing and snow removal.

Now the entire stretch of concrete is flanked by grass, nature's best guard against erosion. It presents a pleasant as well as practical picture, with

its streamlined cross-section comprised of graceful shallow gutters and rounded backslopes.

This improved road has weathered a most severe test. When a 4½-inch cloudburst struck the area, July 10, 1940, the roadways took the drenching in their stride. It was the heaviest downpour in the area in 50 years, but there was no apparent erosion along the road.

State highway officials report that all repairs and construction work on the State and State aid roads now is being done according to specifications similar to those used on the demonstration, and that county highway officials are beginning to follow the example set by the State. State and Public Roads officials use the demonstration as a show window for the benefit of highway engineers.



Out went a check dam, and in its place a carefully graded gutter to conform to the streamlined cross-section. In the picture above, the man at the left stands at the bottom level of the original ditch. The alfalfa hay in the picture below is quiet testimony of the wonders wrought.



Sodding proved effective where there was over-drainage of bank slopes, and where ditches carried large quantities of water on steep grades—and contracts by the State highway department for this preventive measure show how popular it has become.

In 1936 only 6,395 square yards of sod was laid on roadways in the State, but in 1941 the total reached 1,385,000 square yards. Bids on sodding for Minnesota highways averaged about 15 cents per square

(Continued on p. 17)

IOWA'S WIRKLER AND HIS VICTORY FARM

By GLENNON LOYD¹

Helmuth Arno Wirkler, called "Butch," talks "soil conserving" everywhere he goes—and he gets around in northeastern Iowa.

Butch is a solid chunk of a man with massive shoulders. He wears no ordinary man's collar—his neck calls for size 20. Fifty-five years old, he does a day's work along with his 27-year-old son, Merle, now the junior partner on the place. In keeping with this, Butch has a ruddy complexion, an energetic mind and a refreshing sense of humor.

I went to the farm to find out how Butch Wirkler was answering his country's call for more eggs, pork, and milk to meet wartime needs, and why he had acquired a reputation as a crusading soil conservationist. This Iowa farmer, who likes to talk "soil conserving" even more than to go fishing, was waiting at the farm for me in spite of the fact that, as he said, he had been tempted to slip down to the dam to catch a mess of catfish for supper.

Last winter Butch spoke on soil conservation at more than 20 meetings. Seven of them were in connection with the expansion of the Clayton County Soil Conservation District, of which he is a commissioner. He also told his appealing story before civic clubs, luncheon groups, farmers' meetings in other counties and over radio stations.

Butch isn't the "do as I say, not as I do" type. He practices what he preaches and, to use his own words, "I haven't a row on my place that runs up and down hill."

He lives on a 240-acre farm northeast of Elkader, Iowa, in a community where most of the farmers are of German descent and are thrifty and efficient. A glance at the countryside shows you that the "seeds" of soil conservation sown by Butch in the minds of his neighbors and friends have had a high percentage of germination. Approximately 200 farmers in the county now have complete farm plans, and an additional 400 have some contouring and other soil-saving practices.

Ten years ago, like most other farmers in the Nation, Butch cultivated his slopes up and down hill and gave little attention to erosion. The only thing that concerned him was that three gullies were working back into his fields. Seven years ago he visited a CCC camp in the county to see if he could get some help in plugging up the gullies.

"Well, the boys came over," he recalls, "and we fenced off the ravines and planted them to trees.

I had no idea at that time, though, that I'd ever be using any soil conservin' practices. Then one day a boss from the camp came back. Out of courtesy, I went out with him to look the place over and he began to talk strippin'. It was so raw and windy that almost before I knew it I had agreed to let the boys strip the back forty. It was back out of sight and I didn't think there would be so much talk about it among the neighbors if I could hide it.

"I felt foolish, but I thought about it so much that I just had to tell somebody to release the pressure. So the next day when I was riding with two of my neighbors to a sale, I started several times to tell them what I had done. Finally, when we were almost there, I told them, and as soon as we arrived I lost myself in the crowd to get away from their ribbing."

But Butch was not ribbed for long about the strip-cropped back forty. "When we were going through the corn the second time that year, we had a big 3-inch rain that sold me on soil conservin'," he continued his story. "I went out on the back forty and looked. There was practically no soil washing there. But the waterway draining an adjoining field was filled with silt from the slope planted up and down hill. That switched me over from thinking I was doing the CCC boys a favor. They were doing me a great big one."

Since then he has returned the favor manyfold. His complete farm plan is a productive blend of contour strip cropping, buffer strips, terraces, game refuges, and grassed waterways. These supporting practices are coupled with liming, manuring, fertilizing, and an easy-on-the-land rotation of corn, oats, meadow and meadow. The 210 acres of work land on the Wirkler farm, Butch estimates, now produce about a third more than they did before he took up soil conservation.

"Here at our place we have quit robbing future generations of the benefits of this rich soil," Butch asserts. "Our soil conservin' practices hold the soil and moisture where we want it and the lime and fertilizer right where we put it. We know that contouring makes operations easier and we get the work done with less power. We also have the satisfaction that comes with knowing none of our crops will be washed out and that our topsoil won't be down in a gully the morning after a rain. For those of us who used to pick corn up and down hill, believe me, picking it on the level is a real pleasure."

Our country is clamoring for more eggs, more

¹ Head, regional current information section, Upper Mississippi Region, Soil Conservation Service, Milwaukee, Wis.

pork, and more milk. A year ago Butch had 300 hens. Now he has 400 laying. Last year he raised and fed out 200 pigs to an average of 260 pounds, heavier than usual. This year he saved 240 spring pigs and plans to raise 50 additional fall pigs. A year ago he was milking 24 cows. Now there are 32 milkers in his Guernsey herd and production is at peak. That's really stepping up production on the farm assembly line, isn't it? In addition, this farmer is contributing to the war effort by purchasing war bonds, encouraging his neighbors to do likewise, and selling all the scrap iron from his place. In answer to the appeal for more soybeans, he planted 10 acres of that crop. The beans are on the level land and, needless to say, they are on the contour.

This year, in order to get more feed for his enlarged herd of hogs, he planted 70 acres to corn—130 percent of his AAA acreage allotment for that crop. He felt that he could do this in the emergency because he knew which part of his land was in such shape that he could impose on it without destroying the soil's fertility and productivity.

"I won't get my corn payments," he explains, "but I'll still get my payments for soil conservin'. I am a firm believer in the Triple A and I always have been. I think it is the only thing that held us farmers together, and we're going to need it more than ever after the war ends."

Butch has been on almost every strip-cropped field in his county. The county AAA committee uses him to measure the strip-cropped fields. He maps and measures them when they are laid out. It is much easier to measure the fields then, and it has an additional advantage—the farmer can plant strips with the assurance that he is keeping within his acreage allotments.

On his own farm, because of his rotation, Butch can operate his strips on a two-field system and pasture all the strips in one field each year without putting in temporary fences. He takes proper pride in the fact that in the 22 years he has been on his farm he has seeded only 5 acres of oats without a legume mixture. For both hay and pasture, he uses a mixture of alfalfa and red clover, with a little timothy. His corn yield the last few years has been averaging 100 bushels per acre, 30 percent higher than it was back in the days of up-and-down hill cultivation. He attributes part of the increase to his soil-saving program and part to hybrid seed. His pastures are better, his hay yields higher and his oats yields also are up. Under his rotation system, Wirkler turns under sod for his corn ground, and he never sells any corn or oats as grain. He has spread 375 tons of lime on 115 acres of his cropland in the last 6 years.



"Butch" Wirkler flaunts three lusty "squeals" for freedom.

In addition to the 240-acre farm, Butch has 40 acres in a large timber tract 3 miles from his place. He considers it a "very valuable piece of property." His timber furnishes all his fuel and fence posts, and there is ample saw timber for his needs. He has cut lumber from it to build his two-car garage and for an addition to his residence, a granary that holds 5,000 bushels of corn and 2,500 bushels of oats, and a chicken house accommodating 300 birds.

Butch's neighbors and friends keep him well supplied with tales of their experiences with soil conservation, and he uses them effectively in his talks.

For example his neighbor, Ray Reiersen, was a bit skeptical about the benefits of contour planting, but was willing to try it. Reiersen planted one field to corn on the contour last year, but another field not as steep or as eroded, he treated the old up-and-down-hill way. The yield from the contoured field averaged 90 bushels last fall, 35 bushels per acre more than the one planted in straight rows.

Butch also tells of another friend of his who vowed "I'd quit farming and sell the place before I'd farm

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THE UNEXPECTED REJUVENATION OF GEORGE CREEK

By G. C. DOBSON AND H. A. EINSTEIN¹

THE case history of George Creek is the story of a small stream that has passed through a complete cycle of sedimentation within the time of men now living. Beginning as a stream that fulfilled the proper function of draining its watershed without frequent and severe flooding of its bottom lands, it experienced a relatively long period of aggradation that clogged the channel with sediment, raised the water table and turned most of the valuable bottom land along it into worthless swamps, and then entered upon a period of rejuvenation that in a relatively short time degraded the bed sufficiently to enable it again to drain its area effectively. That this rejuvenation was the unexpected and unexpected result of the construction of a dam and the installation of some sand pumps not only makes the case more interesting but leads to the intriguing question of whether it would be possible to develop an economically feasible soil conservation practice for inducing this process of rejuvenation.

George Creek is a small tributary of the Saluda River in South Carolina. It has a length of about 10 miles and a drainage area of about 30 square miles. It crosses the old Greenville-Easley highway $3\frac{1}{2}$ miles above its confluence with the Saluda River. Within these lower $3\frac{1}{2}$ miles, the stream has a bed width of from 30 to 40 feet and flows through an alluvial flood plain that averages about 300 feet in width.

From talks with many farmers and residents of long standing in the community, owners and operators of sand pumps, and officials and operators of the nearby power plant on the Saluda River, it has been possible to reconstruct the history of George Creek with reasonable accuracy.

Up to the time of the War between the States, the channel capacity of this stream was sufficient to carry all flows but the more exceptional floods without overbank flow. These occasional floods very slowly built up the flood-plain surface with sediment of fine texture, predominantly silt and clay. In the post-war period the readjustment of agricultural management, together with the development of transportation facilities, brought about a great increase in cotton acreage in this area and a marked increase in soil erosion. This accelerated erosion greatly increased the amount of sediment delivered to George Creek.

When the coarse sediment or bed load exceeded the transporting capacity of the stream, the sediment began to deposit on the bed and clog the channel. This process of aggradation continued until only 1 to 2 feet of free banks remained. The raised water table that resulted from this process, combined with frequent flooding, transformed the whole valley into a swamp or marsh, usable only in spots as low-grade pasture. Accompanying illustrations show Beaver-dam Creek in the South Tiger watershed where these conditions still prevail.

In the years 1905-6 a hydroelectric power dam was built on the Saluda River about 4 miles above its confluence with George Creek. At that time the Saluda River was similarly choked with sediment. It is said that although the dam trapped the whole supply of coarse or bed sediment moving down the river, the channel below the dam did not change noticeably for a number of years. In 1925 a commercial sand pump was installed on George Creek about $1\frac{1}{2}$ miles above its mouth. The quality of the sand proved to be excellent for building purposes, and, therefore, large quantities were sold. Several more pumps of the same type were set up along the stream in the following years. In 1928 the Saluda River had an extremely high flood that resulted in cleaning out the river bed below the dam, lowering it a number of feet. Since that time, the bed of George Creek has been lowered gradually to a position 8 to 12 feet below the banks. The valley bottom has not been flooded for several years and the formerly useless swamps now make first-grade pastures and cornfields.

Within the last 2 or 3 years there has been a noticeable reduction in the supply of sand coming down the creek. The owners of the commercial pumping plants are complaining about it, but the farmers along the creek are well pleased. Two influences could be responsible for this reduction in the supply of sand—the effect of soil conservation practices and a rather marked deficiency in rainfall during this period. The influence of soil conservation measures in this watershed seems small because very little of the land is terraced. Unless the next floods prove the contrary, it seems safe to assume that the deficiency in floods is mainly responsible for the low sand supply. However, the two influences mentioned could not have been significant factors in the unexpected reclamation of the

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flood plains of George Creek because the rejuvenation of the stream was complete, or well along toward completion, before the decrease in the incoming sediment load became noticeable.

When we compare the watershed of George Creek with similar watersheds where the streams have not been rejuvenated, it seems evident that the two main influences responsible for the lowering of the stream bed and the resulting reclamation of the valley bottoms are (1) commercial sand pumping and (2) lowering of the bed of the river into which the stream flows. It must be emphasized here that the creek itself cleaned out its bed and that no dredging was done along the stream except at a few fixed points by the sand pumps. All this logically suggests the question of whether or not a method could be devised, utilizing these influences, singly or jointly, to achieve the same results in other localities without direct dredging and at permissible costs. Of course, such a method would have to operate in harmony with the laws of transportation of sediment by flowing water.

It is generally acknowledged that the rate of transportation of bed sediment in a natural stream is governed by the composition of the bed material and the flow of the stream. Inasmuch as the composition of the bed material remains substantially constant for a particular location, it may be neglected in discussing the variations in the rate of transportation. The reaction of the flow on a certain part of the bed can be defined by any one of several pairs of measurements. For convenience the measurements selected in this study are the discharge per unit of bed width and the surface slope of the water, although other factors, such as the depth of water and the average velocity for a unit of bed width, could be used. It is known from laboratory studies that the rate of transportation increases with increases in either the unit discharge or the slope. Heretofore it has not been possible to obtain quantitative measurements of this relationship in natural streams because of the lack of satisfactory methods of measuring the rates of bed-load transportation in such streams.

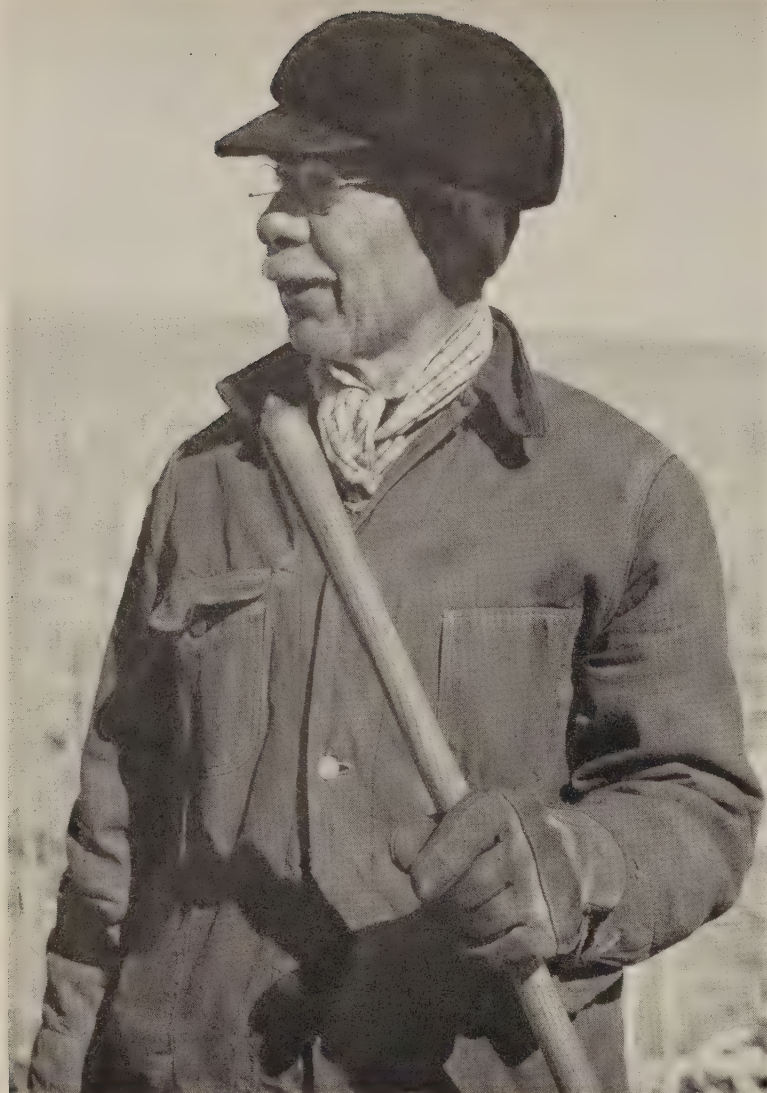
Within the last year a portable device has been constructed by the Sedimentation Division, Soil Conservation Service, for measuring the rate of bed-load transportation in small streams. Measurements made on Mountain Creek, a tributary of the Enoree River, S. C., have given some interesting results that soon will be published. For this discussion it is necessary only to know that the rate of transportation increases more rapidly than the unit discharge for a constant

slope. This means that the amount of material transported per cubic foot of water increases with an increasing unit discharge. The same total amount of water passing at a particular time will therefore transport more bed load in a narrow section of the channel, where the unit discharge is greater, than in a wide section where the water is spread out and therefore the unit discharge is smaller.

These principles apply to the problem of George Creek. Before 1860, this stream was able to transport its sediment load without aggrading its bed. After that time a rapid increase in sediment load took place both in the Saluda River and George Creek. At some point on the creek which cannot now be determined, the load first exceeded the transporting capacity of the stream and sand was deposited on the bed, forming an obstruction and reducing the slope. The slope was progressively decreased upstream, thus decreasing the transporting capacity of the flow. More sediment was deposited upstream and, like a contagious disease, sedimentation spread throughout the length of the channel. This process of plugging probably started at different points in the channel at different times, but the depositions eventually merged into one another. With the higher bed, smaller floods went overbank, spreading out their waters, and thus again decreased the ability of the stream transport. So the bed was built up until the channel was able to contain only low-water flows, while the ground-water level rose in the flood plain and the land became swampy. Meanwhile much bed sediment was spread over the valley bottoms and a much smaller portion than formerly went down the stream. If this cycle had continued for centuries, the bottom lands probably would have been built up until the creek was able to carry its greater load within its banks at the new and increased slope.

The cycle of aggradation was interrupted, however, by the works of man, by pumping sand and the building of a dam. Unfortunately, there is no basis for evaluating separately the effects of these two factors in bringing about the changes in George Creek. The dam built on the Saluda River in 1905-06 seems to have been an efficient sediment regulator that caused most of the sediment to deposit in the reservoir and at no time passed more sediment than the stream below the dam was capable of transporting. Prior to 1905 the Saluda presumably was aggrading its bed and would have continued the process had not the building of the dam interfered. From 1905 to 1928 the bed of the

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R. C. Rayburn, who pepped up pinto production.

TERRACES QUADRUPLE PINTO BEAN YIELDS

By R. G. HOWARD¹

"Terraces have doubled the value of my land and more than doubled my bean yields," is a statement often made by R. C. Rayburn, a farmer living about 30 miles east of Albuquerque, N. Mex.

His farm lies on both sides of U. S. Highway 66, where it is seen daily by hundreds of tourists and by most of the local farmers. Tourists whiz by—slower than they did before December 7, but nevertheless too rapidly to get more than a hasty glance at rolling fields and fence posts and occasional houses. But the farmers travel more slowly. They go by on horses and tractors, or drive their cars with an observing eye, because, next to war, farming is news in the little town of Edgewood, 2 miles west of Rayburn's farm.

¹ Unit conservationist, Southwest Region, Soil Conservation Service, Albuquerque, N. Mex.

In Edgewood, people gather at the post office or Denton's Cafe or Bassett's Bean House, and talk. They talk of war and of farming—of contour farming versus straight line farming, of terrace farming versus down hill farming, of strip cropping versus large fields of a single crop. Their arguments are backed by farming experience, and are won by yields when crops are harvested in the fall.

Like farmers everywhere, they have a pride in their work and believe their land the best in the world. It becomes a part of them and they hate to see it wash or blow. True pioneers and true Americans, all have different ideas of how to farm and how to control erosion and conserve moisture. Rainfall averages only 17 inches a year in this area, and all that can be held on the land where it falls means that much more toward the growing of a crop. The biggest factor against the farmers is time. To hear them tell it, planting is invariably a month late, they miss a couple of cultivations during the summer, and harvesting runs on into winter.

R. C. Rayburn is typical of this group. An elderly man, he moved to Edgewood in 1937. He had owned his farm there for several years but had previously rented it to a share cropper. The surface soil had blown and washed away until it was considered the most run-down farm in the Edgewood community. He followed the custom of the country by planting most of his acreage to pinto beans. He hoped to meet the average production of 300 pounds per acre, but autumn rolled around and he harvested only 200 pounds per acre.

The next year, 1938, was dry. The only rains were hard, dashing showers that ran quickly off the sloping land. Hard, dashing showers and side-hill fields do not make the ideal combination for bean production. Mr. Rayburn did not even bother to harvest his crop.

In the winter of 1938-39 Mr. Rayburn walked over his fields and studied the mounds of blow sand along the fences and the gullies that carried away both topsoil and subsoil. One gully was 2 feet deep. The field had been farmed in two pieces because he could not cross the gully. As he studied his problems he remembered that his father had farmed terraced fields in Louisiana 55 years ago, and he recalled that his father had often said, "Son, terraces and contour farming distribute moisture over a wide area. They prevent concentration of water in one place and if too much falls, they turn it loose where it won't hurt anything." So Mr. Rayburn solicited the aid of the Soil Conservation Service and terraced his farm with the assistance of a CCC camp.

He received lots of advice from his neighbors about his "stunt." Some of them said he would

never be able to negotiate the curves. Others said his tractor would turn over the sides of the broad-base terraces. Several, skeptical of the Government and its "gift horse," argued that Rayburn would be "taxed to death and lose his farm." But Mr. Rayburn had studied his cooperative agreement with the Soil Conservation Service until he knew it almost word for word. He felt, so he said, that it was for the good of his land, and he "figured" the Government was really trying to help farmers.

In 1939 the rains again fell in hard, dashing storms, but this time the water stayed on the land. Most of it stayed where it fell because Mr. Rayburn farmed on the contour, and every row made a miniature dam. Where the water was too much for the contour rows to hold, it ran down against the terraces and leveled the gullies with silt, and when there was too much for the terraces, the water ran slowly around the ends on to the grass strips along the fence rows. That year the farm averaged 420 pounds of beans per acre.

In 1940 the yield was 686 pounds per acre.

That fall the first hard wind came earlier than usual and many farmers had not finished listing or chiseling their land to prevent blowing. As the wind gained in velocity, dry dust began to creep

along the ground until finally the lighter particles swept upwards in huge clouds while the heavier pieces made dikes along the fence rows. On Mr. Rayburn's farm, dirt started to move, too. But the first terrace served as a windbreak and the wind dropped its load and actually improved the terrace by giving it greater height and width. Half way to the next terrace the dust particles again started to move, but again they were stopped by the terrace—and so on across his entire field.

That evening at Denton's Cafe in Edgewood several farmers were gathered who had passed by Rayburn's farm that day and had seen how the terraces kept the soil from moving. They had always supposed before that terraces and contouring were good only for retaining moisture. But now they realized that terraces were also an asset in the control of wind erosion. Terraces would not take the place of listing or chiseling or cover crops in controlling wind erosion—they knew that—but they would be a great help in holding the soil in place during the first three or four hard winds. Rayburn and a few others who had more recently constructed terraces were the center of a respectful group. They had made a "clean scoop" in the field of conservation.

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The last bits of snow still cling to the contour-listed furrows on this slice of the Rayburn farm. That means more beans. Alternate furrows are listed, and terraces—one of which is shown here—afford added assurance of satisfactory yields.





To speed conservation on a recently acquired 40 acres, Lincoln & Lincoln borrowed level and rod, ran the contours themselves. By this time they were old hands at soil saving, a conservation plan having been put into effect on 80 other of their acres. That's good looking grain sorghum, Jack!

SOUND PLANNING AND HARD WORK

By CHARLES G. WEBB¹

If these two farm people represent a trend in Arkansas agriculture, it is a trend good for the State—and the Nation.

In a State where one-crop farming has predominated, Mr. and Mrs. Jack Lincoln, of Benton County, are practicing diversified farming. In a State where soil erosion has attacked 15,500,000 acres of land, the Lincolns are soil conservation farmers. In a Nation where too many young people leave the farm and where too few farm-born college graduates return to the farm, Mr. and Mrs. Lincoln are graduates of the University of Arkansas. They believe that there is opportunity for young people on farms in Arkansas.

"If we didn't believe that, we would not be here," Mrs. Lincoln remarked.

The Lincolns know that sound planning and hard work are required to make the most of the opportunity, and they practice what they know. They are converting an old eroded 80-acre farm, largely

in dead or dying apple trees, into a paying, conservation-treated livestock farm. They are putting soil-conserving and soil-improving practices on 40 acres which they bought recently.

Evidence that the Lincolns have worked hard can be found everywhere on their farm. Their residence is being improved, and the barn, broiler houses, and other small buildings are in a good state of repair.

When they bought the 40 acres they applied to the supervisors of the Benton County Soil Conservation District for assistance in planning and carrying out a complete soil conservation program on this piece of land. Their farm was not in a priority work area established by the supervisors, and they were told that months might elapse before Soil Conservation Service technicians assigned to the district could reach them.

But at the University Jack Lincoln had learned how to operate a level. He borrowed a level and a rod from the county agent, P. R. Corley, and he and his wife, working together, laid off lines for contour

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cultivation and contour strip crops on the 40 acres. Corn and sorghum were planted on the contour and, early in the fall of 1941, contour strip crops of alfalfa and red clover were planted. Another evidence of sound planning was the fact that lime and superphosphate were applied to the land and heavy growths of soybeans and Sudan grass were plowed under before alfalfa and red clover were planted.

"We always use all the AAA check to buy lime and phosphate to put on the land," Lincoln said. "And we grew and harvested the red clover seed we planted."

Lincoln began his intensive soil conservation program back in 1938 when he became a cooperator with the soil conservation demonstration project in his county. At that time he owned 80 acres in one block—more than 60 acres of it in old apple orchard—and 20 acres in another nearby tract. In 1940 he sold the 20 acres and bought 40 acres adjoining the "eighty."

One of his biggest jobs was clearing off the fruit trees and establishing conservation practices on the old orchard land. This job has been completed on 35.7 acres that now are fully protected from soil erosion and are producing feed and hay crops needed on the livestock farm.

Crushed limestone and superphosphate were spread on 7.5 acres of contour meadow strips of alfalfa and clover which Lincoln has developed, on 5 acres of timothy and red clover, and on 8 acres of timothy and red top meadows. Feed will be produced on the 15 acres of row crop area. The practice of alternating 75-foot contour meadow strips with 120-foot intervals of cultivated crops has been combined with contour tillage and an approved crop rotation to control erosion and to improve the soil.

"There is no question that this program has controlled the washing and has improved the land," Lincoln declared.

Conservation farming methods have helped prepare this farm for increased war-time food production. This farmer and his wife plan to increase milk and egg production 50 percent during this year; pork production 400 percent; oats 25 percent; hay 15 percent; soybeans 30 percent; and the home garden 50 percent. Last fall they were milking 4 cows, and they had 15 heifers, 4 of which were to bring calves early in 1942 and 4 others in the autumn. Whole milk, testing about 4.8-percent butterfat, is sold to the cheese factory at Bentonville, Ark. In this way, erosion-resisting crops are being converted to a food vitally needed by the United States and her Allies.

The hay crops cut in 1941 included 20 wagon loads of red top and timothy, and 20 loads of red clover. Barley, winter oats, corn, and grain sorghums are

among the other crops grown. Approximately 16 acres of formerly cultivated land have been developed as pasture. Bermuda grass, bluegrass, perennial ryegrass and lespedeza are in the pasture.

Broiler production adds to the farm income—there are broiler houses sufficient to grow 6,000 chickens at one time, and within 12 to 14 weeks the broilers average 3 pounds. As a means of producing more food at home, the Lincolns are establishing a 1.5-acre orchard and vineyard. Trees and vines will be placed on the contour and other soil-conserving, soil-improving practices will be used.

STREAMLINING CUTS UPKEEP

(Continued from p. 9)

yard in 1941, whereas in some nearby States the average was 40 cents. The seeding method of establishing protective vegetation along the State's highways has enjoyed the same widespread expansion.

Costs of maintaining the right-of-way on the demonstration strip have been reduced \$125 per mile per year. Comparative snow removal costs are not available, but studies made on similar work in Minnesota show that the saving has been as much as \$800 per mile a year.

Finally, here is the studied evaluation of the work made by Harold E. Olson, Minnesota State Highway Department roadside engineer:

"We feel that the Zumbrota-Pine Island demonstration was very much worth while. In value based on fair unit prices, the State received a dollar's worth of actual value for each 59 cents expended.

"In addition, the construction of the streamlined cross-section and the obliteration of the old construction scars have transformed this area, which formerly required a great deal of maintenance, into an attractive development, the cost of which was well warranted because of the maintenance savings."

WIRKLER AND HIS VICTORY FARM

(Continued from p. 11)

that crazy new way." That farmer, however, saw the benefits his neighbors gained and today has every field on his place contour strip-cropped.

In addition to his many other activities, Butch Wirkler sells some hybrid seed corn to his neighbors and friends. "Every now and then I forget what I'm doing at the moment and give them a sales talk on soil conservin'."

Butch is deeply concerned about the prospect that war production may deplete further the soils on many farms. That is why he says with feeling: "We have just got to take care of our land. Why, eventually most all the cost of this war has got to come out of the soil. We just can't allow it to be wasted."

PLOW METHOD OF TERRACE CONSTRUCTION

By PAUL M. PITTENGER ¹

Advantages of Constructing Terraces With a Plow

1. All farmers have the necessary equipment, and it is always available when conditions are right for terracing.
2. Labor and equipment costs are low.
3. Farmers understand the operation of a plow.
4. Terrace cross-sections are uniform, and areas of exposed subsoil cause little variation in terrace height.
5. Equipment slips very little on curves.
6. Wide channels and ridges, which are so important in terrace construction, are easily obtained with a plow on 1- to 6-percent slopes.
7. Moving of terracing equipment from farm to farm is eliminated.

EXPERIENCES of farmers and Service personnel in the Montgomery County Soil Conservation District (Illinois) show that the ordinary plow—tractor, horse-drawn, riding, or walking—can be used successfully in the construction of terraces. The use of this equipment, some of which is found on every farm, will simplify the job of getting terraces established on the land.

Most terracing equipment is rather expensive and has very little use except for the one purpose, which means that only a few individual farmers ever will own such machines. This fact has made it desirable that we develop a method of terrace construction to utilize ordinary farm equipment.

Terraces are being built in the Montgomery County district with the ordinary farm tractor and two-bottom plow as rapidly or more rapidly than with a small 6- or 8-foot blade grader. One man handles the equipment and very little supervision is needed because all farmers know how to use a plow—they need only a staked terrace line and a demonstration of the system of construction. Twelve miles of terraces were constructed in the district by this method during 1941, while only one-fourth mile was constructed with a blade.

Terraces on 1- to 6-percent slopes, to be constructed from both sides, are started by turning furrows downhill. The stakes represent the center line of the terrace channel, and the first furrow should run 3 to 5 feet below the stakes. With some equipment it is necessary to start plowing about 5 feet below the stakes to avoid knocking them down on the first through.

The stakes are then reset about 12 feet down the slope to guide the return trip on the downhill side. This return trip leaves an "island" 10 to 12 feet wide. From this point, the construction follows a rather definite system of overlapping each three trips on the upper side of the "island" and each six trips on the lower side. By following this system, a "wave" of soil 6 furrows wide will be pushed over the "island" from the upper side, and a wave of soil 12 furrows wide will be pushed over it from the lower side. Usually the terrace is complete when this "island" is plowed out, or covered, and the waves are well lapped together.

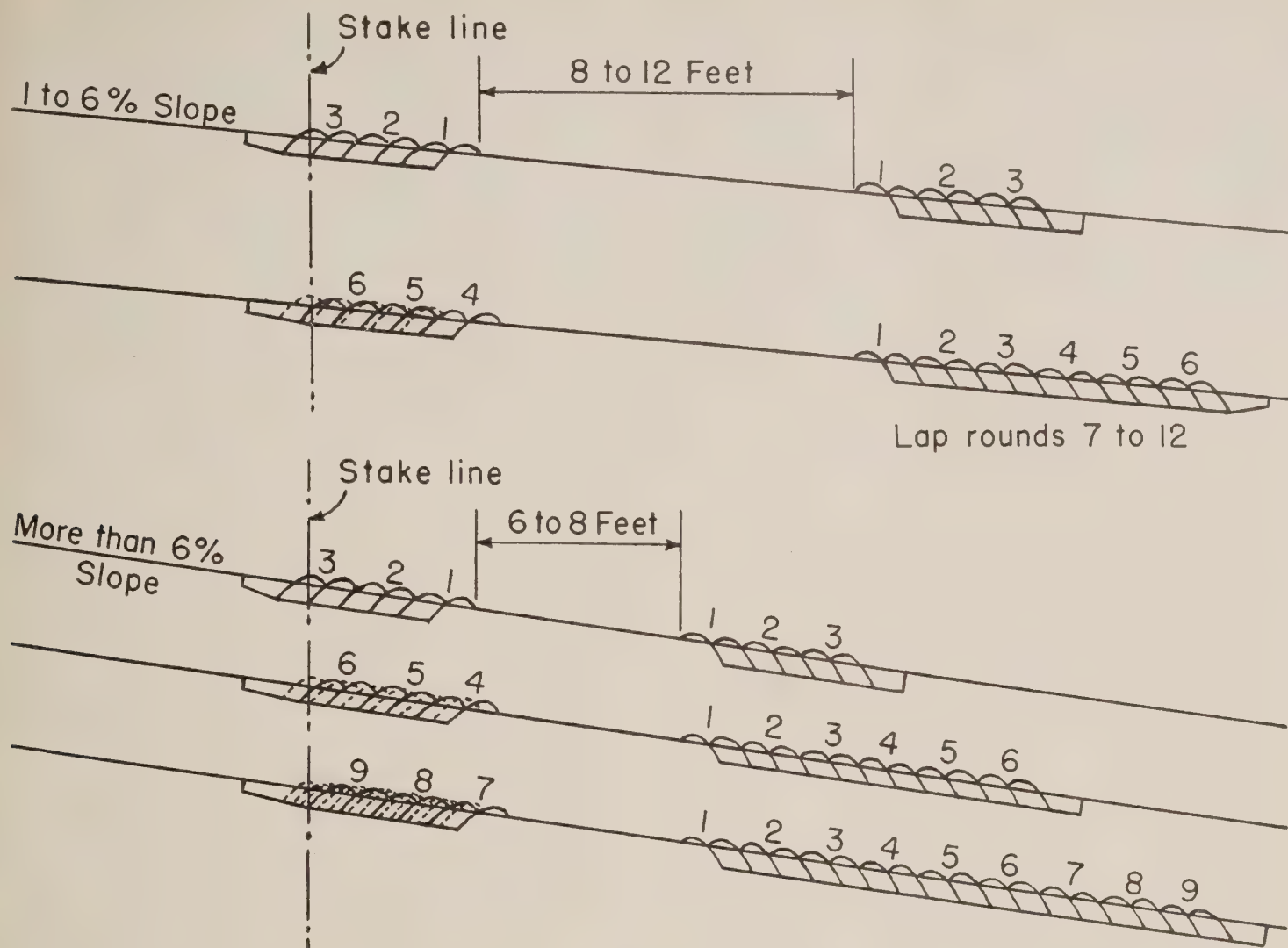
The plowing must be deep in order to give the terrace sufficient height. This can be done by keeping the tractor or team well up on the loose soil. Twenty-four rounds usually will complete a terrace. One additional round is then made—one trip at the upper base of the ridge and one trip at the lower base of the ridge, with the rear plow set shallow—to help develop a more uniform cross section at these points.

The terrace channel is established when the island is covered, so it is important to have it of sufficient width to form the desired channel. A 12-foot island will form an 8- to 10-foot channel. When plows of sizes are used, the number of trips is varied to form a wave of soil of approximately the same width as that formed by a two-bottom 14-inch plow. A two-bottom 12-inch plow works best in series of four trips on the upper side and eight trips on the lower side.

When the above procedure is followed the terrace should have approximately the following dimensions: Bottom width of channel, 8 feet; settled height of ridge, 1.1 feet; width of ridge, 24 feet; and total disturbed area, 38 feet. Additional height can easily be attained by back-furrowing.

Terraces on slopes steeper than 6 percent usually should be constructed entirely from the upper side.

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Terraces on slopes over 6 percent are built from the upper side only. The "wave" is three furrows wide to cover an "island" 6 to 8 feet wide. Return trips just plow below the terrace.

Starting the terrace on these steeper slopes is the same as for less steep slopes, except that the island should be only 6 to 8 feet wide. Operations in completing the terrace will be similar to those followed in constructing the terrace from both sides, with the exception that the field is plowed below the terrace on return trips and a wave of soil is not brought from the lower side to cover the island. Usually, two-thirds or more of a terrace interval is plowed below the terrace by the time the terrace is completed.

Ed Battles, a key cooperator in the Montgomery County district, constructed 1,500 feet of terraces from the upper side with five horses and a two-bottom 12-inch plow in the spring of 1941. He said: "I had my field almost plowed when the terracing was finished and it worked mighty slick."

The district recommends that all terraces be made with a plow. Farmers have been constructing them at the rate of 150 to 250 feet per hour with two-plow tractors, and as much as 400 feet per hour with three-plow tractors. A few terraces have been con-

structed with walking and riding horse-drawn plows.

Land free of vegetation and with a considerable amount of moisture always works best in terracing with a plow. Where considerable vegetation is present, it usually is desirable to mow and rake the areas to be plowed; however, high-clearance plows can operate where there is considerable trash, provided the jointers, and sometimes the rolling coulters, are removed. Vegetation will cause the most difficulty the second time it is turned. To lessen the difficulty, the first plowing should be shallow, and the following trips should plow twice as deep as the first, especially on the upper side of the ridge and in the channel.

Terraces may be constructed from both sides or from the upper side only. On slopes steeper than 6 percent, they generally should be built from the upper side only. Slopes of 1 to 6 percent may also be terraced from the upper side, but construction from both sides usually gives the most desirable cross-section on these slopes.

THE SULLIVAN SAHARA

By W. S. UFER, E. A. TAYLOR, AND W. H. HILDEBRAND¹

THE village of Sullivan lies within the South Muskegon Soil Conservation District about nine miles from Muskegon, Michigan. It consists of eight scattered residences, a general store, a cement-block town hall, a church, a rural school, and a cemetery.

The stranger in the town is depressed by the desolate helter-skelter appearance of the community. Buildings are badly in need of repair—they seem to have been built without purpose. Some are located along what might be a street; others are scattered on the landscape without rhyme or reason. The church, instead of being in the central part of the town, stands some 300 feet southward from the nearest resident. The entrance of the school faces the back yards of the houses.

Should the visitor be interested in learning the cause of the disintegration of Sullivan he need not search for facts in the archives of some distant institution of learning. He will find the unmistakable cause very near the edge of town. It is blowsand—1,200 acres of exposed sand subject to the whims of winds. When in motion, the sand particles find their way into the eyes, ears, nose and mouth of the inhabitant—or the visitor.

During windstorms of high velocities the sand grains are blown considerably beyond the boundaries of "Sullivan Sahara," and within the confines of the "Sahara" even dwellings do not afford the desired shelter from the sand. On windy days tiny sand particles penetrate into the homes through large or minute crevices to be deposited in fine layers on the objects within the rooms.

The school and the church, the collectively established institutions, are menaced by blowsand; it seems they must suffer for the sins committed collectively on the land by their builders, the careless exploiters of the past. Even the dead cannot escape the consequences of their mistakes—the sand masses are gradually creeping toward the graveyard as if to remind the present generation that abused nature will avenge itself eventually on living and dead alike.

Only 50 years ago Sullivan was a busy small town consisting of about 100 residences and 300 to 400 inhabitants. Oldtimers say that most of the residents worked in the 14 sawmills and 12 charcoal kilns, or

hauled timber with their oxen, mules, and horses from the "inexhaustible" forests to the mills. Others transported the lumber from the sawmills and stacked it in rows along the railroad, rows extending as far as the eye could see. Still others earned their livelihood by working in the large railroad warehouse, the hotel, the drug store, the three stores, and several blacksmith shops. Amusement for the local people and visiting lumberjacks was provided in 19 barrooms.

In the Sullivan area, as well as in the neighboring country, lumberjacks of 50 years ago were busy cutting down the magnificent mixed hardwood-coniferous stands. They had the rare "privilege" of felling some of the world's finest white pine. When their logging operations were finished in a locality, the timber was sorted, first-grade for lumber, the next best for charcoal or other products. The remainder of timber and forest was destroyed by repeated fires.

The timber cutting in Sullivan Township was part of the irrational exploitation carried on in Muskegon County between 1838, when the first sawmill started humming, and 1916, when the inventory of "inexhaustible" forests showed no more logs to be floated down the Muskegon River. During the heyday of lumbering, in 1887, the annual output of lumber industries in Muskegon consisted of about 700 million board feet of lumber and over 520 million shingles. Within the 78 years of exploitation, 25 billion board feet of lumber were floated down the Muskegon River, or enough to have built a million six-room houses for the shelter of 5 million persons.

Muskegon lumber was shipped on Lake Michigan to Chicago. Fleets of lumber-laden ships, like endless flocks of seagulls, the oldtimers say, could be seen every day carrying lumber to Chicago. Many homes of the Middle West were built from Muskegon lumber; thus Sullivan contributed partly to the development of Chicago and the vast surrounding area. These contributions, however, were destined to ruin the village and township of Sullivan.

After the timber was removed from the land, farming and fruit growing promised an apparently prosperous future to the settlers. The light sandy soil could be worked with ease. A humus-charged layer of topsoil, formed through centuries of soil building under forest conditions, contained a large reserve of nutrients available for cultivated crops. The ease with which

¹District conservationist and assistant conservationists, respectively, Soil Conservation Service, Muskegon, Mich.

this land could be worked, coupled with its ready and generous response, proved to be its undoing, and its fertility was soon exhausted.

According to the *Muskegon Times*, issue of September 4, 1911, there was a 40-acre, 5-year-old peach orchard 1 mile south and $\frac{1}{2}$ mile west of Sullivan. The orchard was not cultivated, pruned or sprayed. Although many trees died from lack of care, the owner harvested about 1,000 bushels of peaches from his trees. Had the orchard received the needed care, the writer of the newspaper article believed, the yield would have been doubled. In any event, it was yields of this kind that stimulated the establishment of orchards in Sullivan Township.

General farming and fruit growing proved the wrong land uses for the extremely sandy soils of Sullivan Township. Because of its inherent qualities, and the neglectful cultivation, the soil became the prey of wind erosion. By 1925 the land of "Sullivan Sahara" was depleted and abandoned. Today the site of the peach orchard with 1,160 acres of neighboring land is transformed into an area of barren, shifting sand.

For a number of years migration was the settlers' only defense against the encroaching sands. The village shrunk gradually in size and population. Farmers and fruit growers abandoned their lands and homes. Today only dim traces of their former homesites can be found scattered throughout this area of desolation.

The present generation of Sullivan Township inhabitants, more alive to the meaning of proper use of the soil, are doing their best to correct the mistakes of the past, and prevent recurrence of land abuse in the future. These people have started the slow restoration of the "Sullivan Sahara," with the aim of leaving for generations to come a heritage consisting not of blowsand but of resources comparable to those which furnished the means for the establishment of the community more than half a century ago.

The first impetus to proper land use and soil conservation was given by Carl Knopf, the county agricultural agent who in 1925 arranged with 61 landowners for the planting of 150,000 pines on hitherto useless land. Nor was Mr. Knopf content with this achievement; he continued to foster land rehabilitation in Muskegon County and, due to his efforts, 2,000 acres of "worthless" land were reforested with 1,775,000 trees between 1925 and 1938.

The plantations demonstrated the feasibility of reforestation and conservation of those lands that were an actual or potential liability to the owners.

In 1938, when establishment of a soil conservation district was made possible by State law, Mr. Knopf gave his full support to the organization of what is today the South Muskegon Soil Conservation District.

The owners of land subject to wind erosion realized the need of an organized effort to reclaim blow land and to prevent the potential blowing of soil. At the referendum of December 6, 1938, pertaining to the eight townships of the South Muskegon district, most of the favorable votes came from inhabitants menaced by wind erosion. Sullivan Township, having the largest blowsand problem of all, accounted for one-third of the total number of favorable votes.

Soil conservation activities in the area are fostered by many agencies and are being solved by various means. The district, in cooperation with the Soil Conservation Service, is assisting the landowners in solving their individual problems. In addition, the district coordinates the assistance furnished by other agencies. The Extension Service continues to work for the benefit of the district through its educational program. The County Board of Supervisors has made annual appropriations to support the district nursery. The CCC is furnishing labor to stabilize the more extensive blow areas. The National Youth Administration, the Farm Security Administration, and local people have furnished some of the labor needed for operating the district nursery, and for planting trees on land owned by local political subdivisions.

Ownership of land by local public agencies was secured through provisions of the Michigan Tax Reversion Act by which these political subdivisions may acquire title to tax-delinquent land not sold at the mandatory public auction. The soil conservation district encouraged public ownership of this type, chiefly in order to assure the permanency of the expensive and badly needed soil conservation measures; which, as indicated by the absence of bids at public auction, are beyond private means and interest. At present the political subdivisions in Muskegon County own 8,000 acres of land—3,445 acres belong to the schools, 4,300 acres to the townships, and 255 acres to the county.

Since the proper use for these public lands is forestry, ways and means have been developed to reforest them. The Soil Conservation Service prepares the planting plans and provides the technical assistance required to assure their satisfactory completion. The planting stock is provided partly free of charge and partly by purchase. The State Conservation Department furnishes five thousand 2-0 pine seedlings each year to

each land-owning political subdivision. The district lines out the 2-0 Conservation Department stock and returns it to the respective organization as 2-1 transplant material. Within the prescribed limitations the Soil Conservation Service furnishes 2-1 transplant stock. The local public agencies buy, at cost, the remainder of their trees from the district-operated nursery.

Trees are planted by school children, adults, or both, depending on the ownership of land. Each spring and each fall the county agricultural agent and the Soil Conservation staff members organize planting bees on school and township lands. Muskegon County boys and girls and their parents have planted 400,800 trees on school properties since the spring of 1940. Approximately 1,100 school children and parents take part in 40 planting bees each year. At present the schools and townships of Muskegon County can boast of an inventory showing 575,000 trees planted on their holdings.

The conservation work of the district is not limited to physical accomplishment only: The chairman of the soil conservation district's Board of Directors and the County School Commissioner have made provisions whereby the schools of Muskegon County will initiate standardized courses dealing with soil conservation in a broad sense. It is planned that classes be conducted to include the theoretical as well as practical side of conservation, and that these courses be supplemented by field trips to show the young generation the pitfalls of irrational land use and ways and means of preventing their recurrence in future years.

It is true that trees are long in growing to maturity. But, 50 years from now, perhaps the visitor will see a new Sullivan located in the midst of vigorous, green forests, instead of the drab "Sullivan Sahara." Perhaps the town will have new houses, and new streets arranged in an orderly fashion. Even if the resurrection of Sullivan should not materialize, it is reasonable to assume that if the present efforts of the soil conservation district continue long enough the visitor will be tempted to linger for a while in the forests of Sullivan Township, instead of fleeing the "Sahara" that is Sullivan Township today.

REJUVENATION OF GEORGE CREEK

(Continued from p. 13)

Saluda for some distance below the dam remained substantially unchanged, and then the great flood of 1928 cleared out the channel, materially lowering the

elevation of the bed. It is said that at this time George Creek began to clean out its channel and the process was continued until a bed level was reached that probably is lower than it was in 1860.

The first sand pump was installed 3 years before the big flood on the Saluda, and other pumps were installed later. Undoubtedly a considerable amount of sand was removed from the creek bed at one or more points during these 3 years, and it is easily possible that the rejuvenating process had started before the 1928 flood but had not progressed far enough to be noticeable to the local observers. There is also the possibility that the effect of the sand pumps could have caused this rejuvenation without the aid of the Saluda flood. The history of George Creek definitely proves that the rejuvenation of a stream is possible after its excessive sediment burden is removed, but it does not answer the important question of whether the lack of sediment alone will start the cutting or whether some direct assistance must be given to induce the process.

The Sedimentation Division of the Soil Conservation Service is now studying this problem.¹ The method of attack is to select a small stream of the character of Beaverdam Creek and actually measure its transporting capacity. Then, at carefully chosen points, the bed-sediment load is artificially decreased and a study is made of all the effects of these deficiencies. While no predictions are yet possible as to whether the stream can be made to clean out its channel, the results of the studies should shed some light on several problems that are now of much concern in soil conservation and flood-control programs.

TERRACES QUADRUPLE BEAN YIELD

(Continued from p. 15)

In 1941 Rayburn harvested 879 pounds of beans per acre after a 10- to 20-percent damage by hail. Luckily, the hail damage was covered by insurance so that he received the benefits of his potential yield of 1,000 pounds per acre. R. C. Rayburn is very proud of his terraces and of his method of farming and of his yields.

"Good land is getting scarce," he said recently. "Farmers in this part of the country have got to use terraces and contour cultivation, because they can't move over to new land when the soil on their old farm washes or blows away."

For REFERENCE

Compiled by **ETTA G. ROGERS**, Publications Unit



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¹ Prepared solely for use by the Soil Conservation Service and official co-operators. Not available for general distribution.

² From Superintendent of Documents, U. S. Government Printing Office Washington, D. C.

SELECTIVE SERVICE FOR EVERY ACRE



This is a war of production—
Production of planes, ships, tanks, shells—
And food and fiber.

Crop and livestock yields are increased
Through soil and moisture conservation.

Every acre of agricultural land can be made to
produce

The things needed to win this war—but—
You would not expect to produce planes in a shell
factory,

Nor tanks in a shipyard—

Neither should you expect to produce

Peanuts, cotton, corn, and other row crops
On steep land—or on eroded land
That is best suited to trees or grass.
The row crops will permit severe soil erosion
And after a few seasons
The land may be out of production
For many years to come.
Take a look at the back of this sheet.

Pick out the different classes of land on your farm,
And study the recommended use
And conservation practices
That will keep every acre in production—
The war may be a long one.



To Region IV, Soil Conservation Service, we are indebted for this simple guide to land classifications according to capabilities.

Picture and text were inexpensively processed recently on low-grade paper, and distributed in the Southwest. On the back of each sheet were practical recommendations suited to local farm conditions.

This is another of the numerous devices for getting the war-production job done with a minimum of delay—soil conservation now being accepted as an important way to increase yields.

2032
Page 1

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SOIL CONSERVATION

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

C. R. Enlow in this issue tells of erosion control on Army air bases—Arthur R. Hall digs into history for the record of American farmers in time of war—A Nebraska soil conservation district instructs its members on how they may help toward victory

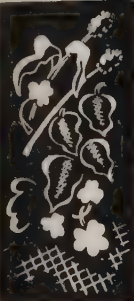
UNITED STATES DEPARTMENT OF AGRICULTURE - WASHINGTON

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WELLINGTON BRINK
EDITOR

SOIL CONSERVATION is issued monthly by SOIL CONSERVATION SERVICE of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. SOIL CONSERVATION seeks to supply to workers of the Department of Agriculture engaged in soil conservation activities, information of special help to them in the performance of their duties. Copies may also be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., 10 cents a copy, or by subscription at the rate of \$1.00 per year, domestic; \$1.50 per year, foreign. Postage stamps will not be accepted in payment.



SOIL CONSERVATION



CLAUDE R. WICKARD
SECRETARY OF AGRICULTURE

HUGH H. BENNETT
CHIEF, SOIL CONSERVATION SERVICE

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SCS HELPS U. S. ARMY HOLD THE LAND

BY C. R. ENLOW¹

Regional Agronomist "Hipe" Morrish, back in December 1941 was in his office at Dayton, Ohio, trying to figure how to bring more agronomy into the soil conservation program. Today, Major R. H. Morrish is trying to get more soil conservation on more army posts. He is one and the same man; back of it is an interesting story of rapidly moving events.

Prior to December, the Soil Conservation Service had received many requests from the armed forces for assistance. All of the regions had furnished technical assistance and some planting material, and the Soil Conservation Service technicians had visited many army posts to advise on erosion control problems. The Washington office had handled a good many inquiries, referring them to the region. Chief Bennett was pleased that the Service could be of assistance with war activities and wrote to the War Department, advising that Service facilities were available to assist with erosion problems at cantonments, forts, arsenals and in fact all points where assistance was needed.

This letter was the beginning of real cooperation, as shortly after Lieutenant Colonel J. R. Pollock and J. L. Vincenz of the Quartermaster Corps suggested detailing Soil Conservation Service technicians to Corps Area Offices in order to make an immediate survey of erosion conditions on army units and develop erosion control plans with estimates of cost. This was done very quickly, and the plans were used as a basis by the Quartermaster Corps for the allocation of funds to put erosion control in effect. Hundreds of Soil Conservation Service technicians were requested to help, and the wholehearted assistance received made it possible to complete the survey in approximately three weeks' time. During the survey, the Construction

Division of the Quartermaster Corps was transferred to the U. S. Army Engineers, but the move was effected with little or no lost motion and apparently did not interfere with the erosion survey. Since that time, the work has been carried on in the Repair and Utilities Branch, Construction Division, U. S. Army Engineers.

One hundred eighty-five army cantonments, forts, air bases, and other army units had been planned for erosion control and revegetation and much engineering and agronomic work had been applied by April 1, 1942, with plans for additional units rapidly being developed. Completed plans were submitted to army officials at the posts for transmittal to Washington through army channels for approval and allocation of funds. When it is brought out that army officials had to secure the necessary seeding and other equipment, fertilizer, seed, and other materials and labor after the funds were allocated, the fact that considerable spring seeding was accomplished speaks well for the Army. To get results in such a short time with a million other things to do is deserving of real commendation.

The problems encountered on the army units include all those that are found in a regular farm-land conservation program, and more. Excavation, grading, diversion and drainage ditches, levees, curbs and gutters, catch basins, retaining walls and structures of many kinds, land and seedbed preparation, lime and fertilizer application, seeding and sodding, application of topsoil, mulching, gully control, and planting of trees, shrubs, and vines represent the principal operations and practices that must be planned and applied.

The Soil Conservation Service should be proud, not only of the technical assistance rendered, but of actual savings effected. In one extreme case, \$890,000 had been requested to control bad erosion and drainage problems at one army post. Soil Conserva-

¹ Chief, agronomy division, Soil Conservation Service, Washington, D. C.



Gutter at side of runway filled with mud from fields at side; runway itself silted over, drainage of airport destroyed. Typical of what has happened when airfields have omitted careful provisions for regressing disturbed areas.



Hazards removed by vegetative control. The same gutter cleared and protected against future downpours by careful preparation of seedbed and use of grass mixture adapted to local conditions.

tion Service technicians developed a plan, which was accepted by the Army, cutting costs to one-third the original estimate. Innumerable other instances of reduced costs could be given, largely by the use of more vegetation and less construction materials, or the substitution of more economical measures of control.

There are other angles to our cooperation with the Army. Many CCC camps assigned to the Soil Conservation Service have been transferred to army posts

to install erosion-control measures. Our nurseries have supplied the Army with approximately 20,000,000 trees and shrubs and considerable seed of plants not ordinarily available commercially. A section on erosion control was prepared for the Repair and Utilities Handbook, which is available at all army posts. Other publications dealing with erosion-control revegetation and highway stabilization have been supplied in quantity.

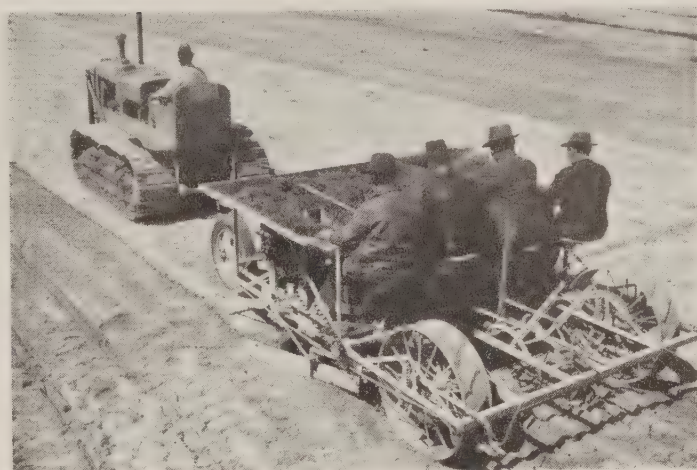


Major R. H. Morrish.

One extremely interesting angle is the development of a "sprigging" machine by F. B. McAlister, superintendent of the CCC Camp at Rock Hill, S. C., to set out Bermuda grass. The machine plants four rows of grass at a time and covers an acre per hour, which is a great saving over setting the grass by hand labor. Celery planters have also been used quite effectively for transplanting grass at some points. Creeping grasses that do not reproduce by seed or that establish very slowly from seed can be handled much more readily by transplanting.

While the entire Service has assisted with this work, Major Morrish and the other men on detail with the Army Engineers deserve commendation for carrying the ball. They have made the arrangements and followed through with the innumerable details that are so necessary to do a big job in a hurry. The others, in addition to Major Morrish, who deserve special mention are C. E. Monfort, Spartanburg, S. C., now Captain Monfort, with headquarters at Atlanta; John H. Cheek, Fort Worth, Tex., now at San Antonio; Arthur Middle-

(Continued on p. 46)



Close-up of sprigging machine in planting position.

A TRULY AMERICAN MACHINE

A machine now being operated at the Army's airport in Lexington County is a good illustration of a fine American characteristic—ingenuity. The machine, drawn by a tractor, plants Bermuda grass sprigs at the rate of about one acre an hour. It is operated by five men, and does the work of many times that number of men.

This odd, but simple machine, was not bought from a manufacturer. It was "home made" for the specific job it is now doing. In it are only a few new parts, all the other parts being assembled junk from discarded machines. Here is how it happened to be made:

The Soil Conservation Service and the CCC were asked to equip the airport with grass, or with some other low-growing vegetative covering to control dust and for other good purposes. The job was a big one for hand labor at this time when labor is scarce. Therefore, F. B. McAlister, superintendent of the CCC Camp at Rock Hill, decided to make a machine to do the work in a hurry, and that's exactly what he did.

Basically, the machine is something like this: First, four side-by-side plows. Next, four chutes down which pass fertilizer and grass sprigs, into the furrows cut by the plows. Behind the chutes are cover scrapes, and two packer wheels. Above are four seats for men who feed the fertilizer and the sprigs into the chutes. The dingus is compact, and may be operated by any normal laborer after preliminary instruction of one or two minutes.—Editorial from the State Newspaper, Columbia, S. C.

WAR POINTERS FOR FARMERS OF A NEBRASKA DISTRICT

Practical ways in which a soil conservation district can help to win the war are ably set forth in a letter from supervisors to farmers in a Nebraska district. Because of the care with which the local program was worked out and presented by farmers to farmers, Soil Conservation reproduces this letter in full.—The Editor.

HARRISON, NEBRASKA,
March 14, 1942.

At the present time all of us are faced with a serious situation. Probably more serious than we realize or care to admit. Many of us are wondering what we can do that will be the most useful. Some of the things that have developed seem important to us so we take this opportunity to call them to your attention.

There is a definite need for an increased production of certain products but our area can only contribute to some of the needs and it is our opinion that our efforts should be toward the increasing of production of those items which are needed and the production of which our District is suited. Beef cattle, lambs, and wool are our principal products that are needed and to which we can contribute. Increase can be made best, not by increasing the number of head of sheep or cattle which we own, but by making the livestock we have produce more pounds of beef, lamb, or wool. One method by which this can be accomplished is by better feeding. Better feeding will involve the feeding of stock during the winter so that there will not be a heavy loss in weight but perhaps a gain. Most of us have available a good supply of hay this year for livestock feeding. Let's use it during the winter and early spring to keep our livestock in the best condition possible.

Livestock losses are not confined entirely to the number that die. The loss in weight by livestock being wintered means a loss in pounds of beef or lamb that must be gained back after winter is over. For example, if you were wintering 50 steers that weighed 600 pounds each in the fall and at the end of the winter they weighed only 500 pounds each, you would have a total loss of 5,000 pounds of beef, or the equivalent of losing 10 steers of 500 pounds each. This is a hidden loss, but none the less a heavy loss to you and now it is more important when the extra food is needed by our country and allies.

Proper stocking of pasture areas so as not to overgraze them will help, as it has been shown that more pounds of beef, lamb, and wool can be produced by properly grazing range land than by overstocking with extra livestock. Furthermore the pro-

tection of range land, so that it will continue to produce is essential. They tell us that this is going to be a long war and production will be needed next year and the year after. We can also help ourselves to be prepared for the period of adjustment following the winning of the war by not being overstocked and not having depleted range lands.

The improvement of pastures by proper management and the developing of our hay and crop land by the use of soil conservation practices so that they will supply more feed is one of our jobs in this national war effort. Our Soil Conservation District is ready to help as many as possible of you in the effort. We have available some trained personnel who are loaned by the United States Department of Agriculture to help us.

While the applications already received are sufficient to keep all available personnel fully occupied it is our desire that as many of you receive assistance as possible. This may mean fewer complete Agreements can be prepared but more of you will secure needed assistance.

The use of minerals which include calcium and phosphates has been found beneficial in this area. The use of this is not only to prevent death loss of cattle and sheep, but it has been proven that its use will help in producing stronger and heavier calves and lambs which will gain faster and make the feed available go farther. The mineral supplied need not be an expensive or complicated mixture. Simple, economical minerals have given good results. Salt and mineral feeding is not expensive and the increased gains will be profitable, not only to you, but also to our national welfare.

The production of food supplies for home use by means of a garden is another way of aiding our country. By producing as much food as possible in our gardens and using home preservation methods transportation facilities needed for other work can be released. It will also make it possible to save on essential material used in making tin cans.

Farms are one of the most important sources of scrap iron and steel, now so urgently needed for national defense. Consequently a nationwide drive is being made to encourage farmers to market their

scrap iron and steel. By collecting scrap iron now, you can help relieve shortages and stand a better chance of obtaining repair parts for your machinery. In addition, in going over that scrap iron on your place you may find spare parts that you can use for repairs. Furthermore, by selling now you can be sure that this iron will be used by our own country and not be shipped to other countries to be later returned in the form of shells and bombs by our enemies. Collect your cast iron, miscellaneous iron and steel, take it to your nearest dealer in salvage iron and steel. Do not delay in this or wait for higher prices as prices are not likely to advance much above their present level.

The problem of machinery and equipment is a serious one for all farmers. Proper care of machinery, greasing when needed, making minor adjustments that will prevent extra wear and break-

age, will help to cut down repairs and to increase the life of the machinery you have. The early purchasing or ordering of repair parts that you need or will need will prevent delays in getting these parts when needed and at the same time make possible a more orderly system of handling. Remember your machinery dealer is having just as serious time with shortages of labor and material as you are and this is one way in which you can help him and at the same time help yourself.

Very truly yours,

A. L. SCHNURR, *Secy.-Treas.*

FRANK E. ARNER, *Chairman*

C. W. GOLDEN

CHAS. FERGUSON

JACOB WASSERBURGER

Sugarloaf Soil Conservation District
Board of Supervisors.

THIS ISN'T THE FIRST TIME

BY ARTHUR R. HALL¹

Guns or butter—American farmers never have been allowed a choice between the two in time of great wars. Generally they have had to produce the butter and wield the guns too. In all of our great wars the problem of increasing production and at the same time furnishing men for the Army and Navy has been urgent, and economic trends have been somewhat comparable. Nevertheless, each war is unique. We remember the problems of the farm front during World War I. Let us consider those of two of our earlier wars, the Revolution and the Civil War.

The task of the Continental Congress during the American Revolution was to conduct war for a nation that legally did not exist. States were asked for contributions of money and supplies, but these were not always forthcoming. New England furnished cattle, rum, and salt. The Middle Atlantic States supplied flour and forage for the Northern armies. The Continental forces in the South drew heavily upon North Carolina for meat and leather.

Possessing no hard money of their own, the Congress and each of the States issued paper money to pay for supplies. So great did this flood of paper become, and so rapidly did it depreciate, that it was said "a wagon load of money would scarcely buy a wagon load of provisions." The Congress urged the States to fix prices by laws, a policy that proved unworkable after a year's trial. At length, worthless currency forced governments and individuals to

barter their goods and services. Maryland, for instance, accepted tobacco and salt in payment of taxes and traded this for wheat, flour, and bacon for the troops. An officer of the French Army in America told of an innkeeper in New Jersey who rented his inn, a large barn, and two or three acres of garden for 84 bushels of corn. In contrast, the English had good hard cash with which to buy supplies. They were able to live well off the country, while nearby patriot forces were critically short of food.

Nutritional values were appreciated by members of the Congress even though dietetics had not yet become a science. Elbridge Gerry informed the Commissary General in March 1777 of the "wish that measures may immediately be pursued to provide gardens for supplying the army daily with vegetables . . . Without these the soldiery will be sickly and dispirited and the service injured if not ruined . . . Few men can subsist on bread, meat, and water." Nevertheless, a shortage of fresh vegetables continued.

The provisioning of the Army and civilian population was restricted by several bottlenecks, the principal one being the lack of salt, normally imported from overseas. In 1777, even before severe currency depreciation had set in, salt in Baltimore sold for \$20 per bushel. Lacking salt, the commissary department could not cure beef and pork, even though hogs and cattle might be plentiful. In addition, roads were bad, and much produce was spoiled in transit to the Army. Impeding farm work was the

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taking of great numbers of horses for the cavalry and for use in transporting supplies.

Outside the immediate areas of fighting there was relative abundance, and farmers were prosperous. Fully a decade before the Revolution, intermittent boycotts of British goods had begun to cut down the dependence of the Colonies upon the mother country, and during the war self-sufficiency increased. An English officer held captive by the Americans in the interior of Virginia said that the farmers of that section had reduced the amount of tobacco raised but had increased the cotton crop in order to clothe themselves and their negroes. The poor people made their own clothing from necessity, while the more wealthy did so as an example to the others.

In the eastern parts of the tobacco States—areas suffering from soil exhaustion, erosion, and competition from fresher tobacco lands—the war accelerated a previous tendency to shift to grain production and more conservative land-use practices. The breaking of commercial relations with the mother country enabled planters to escape from their debt bondage to British merchants, who had previously demanded tobacco production. An observer declared later: “As the culture of wheat progressed southward, the country people became more improved in their sentiments, manner of living and independency of storekeepers.”

The generation that fought the Civil War recognized it as a struggle between King Cotton and King Wheat. Southern statesmen felt that their near-monopoly on the world's cotton supply would enable them to starve cotton-consuming European nations, especially Great Britain, into recognizing the Confederacy and preventing the war. The North, on the other hand, believed that bread made from northern wheat was more important to Great Britain than cotton. The war did indeed cause a cotton famine in Britain, but other influences worked to prevent her interference.

With failure of the European wheat crops in 1860, 1861, and 1862, Britain found herself more dependent than usual upon American supplies. Would the United States, torn asunder by civil strife, be able to keep up its production? Answer came with the measured pace of the seasons—138 million bushels of wheat from the Northern and Western States in 1859, but 177 million bushels in 1862, and 173 million bushels in 1863. Britain's increased demand was met, the Northern armies were supplied, and ordinary civilian needs satisfied. The exports of wheat were important, though perhaps not decisive in determining British policy toward the Confederacy. They also provided the Federal Government with gold for the purchase of arms in England.

The impressive increase in wheat production was characteristic of the general expansion in northern agriculture that took place even though many farmers “forsook farming for fighting.” The upper Mississippi Valley contained vast reserves of virgin soil, linked to eastern markets by a growing system of rail and water transportation; and in 1862, the Homestead Act made this land available, practically free, in family-sized farms to actual settlers. New England Yankees, Germans, Swedes, refugees from military campaigns in the border States, flocked in to take advantage of this opportunity. Enough land was taken up under the Homestead Act during the war to make more than 15,000 farms of 160 acres each.

Nor was new land the only reason for increased crops.

Virginia's Robert E. Lee led Southern men from victory to victory, but her Cyrus Hall McCormick had invented a machine that could reap as many acres of grain in a day as could six men using cradles. This machine was destined to lend aid and comfort to Virginia's enemies. The new farms of the prairies and the older farms farther east, short-handed because of the war, adopted the reaper, the new mowing machines, horse rakes, improved threshers, and steel plows. Farmers who remained at home could maintain production because, in the words of the *Scientific American* in 1863, “Farming is comparative child's play to what it was 20 years ago.”

The virgin prairies became wheat fields subjected to the world-old pioneer custom of single cropping until the soil became exhausted. Farther east, where the pioneer cycle had already run its course, more intensive methods and the substitution of the “cow for the plow” were required to maintain war production. The Maine Board of Agriculture advised that:

... improved methods of culture and labor-saving implements should be sought for ... and if by any means a greater supply of fertilizing materials can be drawn from muck beds, from marl pits, from the sea shore, or by economizing home resources, no available means to this end should be neglected. It is the *duty* of every farmer to grow as much food as he can, both for men and beast; and although under ordinary circumstances it is not so good policy to extend the breadth of land sown and planted, as to improve the cultivation of a smaller surface, it may be better in some cases at this peculiar juncture. *

The war emphasized the existing tendency to concentrate on animal industries in older regions. The fattening of hogs for market increased partly because of poor returns from the direct sale of corn. Even in the older parts of southeastern Wisconsin,



A Thomas Nast illustration in the January 1865 issue of the *American Agriculturist* stresses the importance of the farm front during the Civil War.

where wheat could no longer be produced profitably, beginnings were made in the dairy and wool industries. Because the cotton supply was shut off, the annual production of wool in the North jumped from 40 million pounds to 140 million pounds during the war period. Wool became an *ersatz* for cotton but the attempts to substitute linen for cotton, or Illinois cotton for southern cotton, were not so successful. The maple, the sorghum cane, and the beet were called upon to pinch hit for the Louisiana sugarcane, with varying degrees of success, but the sugar shortage was never entirely overcome in the North.

With some exceptions farmers enjoyed the illusory prosperity that comes with currency inflation. Wheat sold for 94 cents per bushel in Milwaukee in 1860, and for \$2.26 in 1864; but the inflated greenback dollar was worth only 35 cents in gold in 1864.

The prices of agricultural products in general did move upward, but not as rapidly, or as high as those of manufactured goods. On the other hand, the Commissioner of Agriculture was able to report in 1866, the year after the war closed, that:

High prices, accessible markets and crops of average abundance have insured good profits, and as a result mortgages have been paid, farm buildings erected, permanent improvements accomplished, farm implements and machinery obtained and in thousands of instances a surplus invested in government funds.

Although cotton played an important part in Confederate diplomacy, Confederate soldiers could not eat cotton. With the principal wheat, rice, and sugar areas of the South exposed to invasion early in the war, with fresh lands west of the Mississippi cut off by enemy action, and ports blockaded, the cotton planters were well advised to transfer their

major energies to the production of corn, hay, vegetables, sorghum, hogs, cattle, and other "eatables." The *Southern Cultivator* sounded the farmers' bugle call to arms with an editorial entitled "Corn! Corn!! Corn!!!" "NOW IS THE TIME," it said, "to keep the plows steadily running, turning up the stiff clay lands to the sun and rain and air—burying under all grass, weeds, and other vegetable matter . . . be sure and PLOW DEEP! . . . Use all the manure you can get . . . PREPARE NOW to cover a larger surface than ever before—to plant and cultivate in a better style, and, with God's blessing, to harvest a larger crop!"

The campaign to increase food production was successful. One foreign observer estimated that the acreage devoted to wheat, corn, and potatoes in the Southern States east of the Mississippi almost tripled during the war, and that there was a drop in cotton production in the ratio of something like 150 to 6. As one editor reported: "If you should ask us what is the rage of our farmers just at this time, we should be fool enough to answer: 'pastu-rage.'" Nevertheless, some planters continued to produce cotton, hoping that the end of the war would bring high prices, and several States passed laws restricting cotton acreages or cotton production. The Georgia law, for instance, set the maximum area per prime field hand at 3 acres, the penalty being \$500 for each acre in excess of this amount.

Even more serious was the problem of distribution. The railroads of the South were few and poorly equipped compared with those of the North and they were not equal to the extra strain imposed by war. When barns were bursting with supplies in the lower South, Lee's army in Virginia was on the verge of starvation. Foodstuffs intended for good rebels, but immobilized in Georgia by lack of transportation, went to feed Yankee invaders on the march from Atlanta to the sea.

Chaotic financial conditions also clogged the machinery of distribution. Like the Continental Congress, the Confederate Government found itself attempting to build a monetary system without benefit of metal or credit—with similar results. Paper money becoming valueless, Confederate bonds were finally sold for produce, and a tax-in-kind of one-tenth of the total crop production was levied on farmers. A law was also passed providing for the forced sale of supplies to the Army. The local purchasing boards for impressed goods attempted to impose price ceilings by paying consistently lower prices than could be obtained in the open market. There were many complaints that farmers withheld produce from the Government and extorted high prices. The producers, in rebuttal, declared that the

amounts paid by the Government were below the cost of production and that they were discriminated against by the tax-in-kind.

For the soldiers, whether wearing blue or gray, there were some compensations for the hardships of military life. There were citations, decorations, and cheers from the sovereign multitude. For the women, children, and old men left at home there was only more work, the work left behind by the absent soldiers. They carried on alone and unencouraged, marching in no parades, receiving no cheers.

A Wisconsin editor reported that the "sturdy, muscular German and Belgian women plough and sow and reap with all the skill and activity of men . . . If need be they will go into the pineries and do the logging." Family tradition in southwest Missouri preserves the story of the farm where, the only remaining mule having been stolen by "bush-whackers," the mother and old grandfather acted as a team to pull the plow while the small son, barely able to reach the handles, guided it over flinty Ozark fields.

A series of letters from a Confederate officer to his wife, now preserved at Duke University, tells a story that was probably typical. His advice on how to conduct the plantation covered numerous matters: Make up the fences on the branch from the old spring and on the side of the Haw hill . . . have rails hauled only when the ground is frozen so the wheat will not be hurt . . . plant a good deal of the cotton land in corn this spring, for corn will be in great demand if this war continues . . . If I was home I would see the county officials in Hell before any of my negroes were sent to work on the roads . . . when work is slack, haul leaves to the horse lot and cowpen for making manure . . . tell Sol to have the sprouts cut in the rye pasture and at the Castles place and put them in the gullies . . . fatten every hog you can for bacon is scarce . . . buy salt as quickly as possible for it has gone up to \$20 per bushel in Charleston . . . if you can spare the time take a load of produce to Columbia . . . peas are worth \$1 per quart in camp and butter from \$5 to \$8 per pound.

A northern woman, a former school teacher, told her story in the columns of the *American Agriculturist*.

After [my husband] entered the army we bought the farm which we had rented . . . I hired a hand, and to the best of my ability, and by the aid of the *Agriculturist*, I succeeded pretty well . . . I labored . . . to lift the heavy payments at the appointed time . . . In the spring I paced the long rows of eight acres, dropping all the corn, in order that it might be in season . . . and I have a nice little crop of corn of near 200 bushels . . . Twelve acres of meadow were cut, and two acres oats. Last winter I had my ground

put in excellent order, and helped to plant out a choice orchard of apple, pear . . . and cherry trees . . . I raised $\frac{3}{4}$ acre of sorghum, stripped and cut it myself, and have the pleasure of a nice barrel of molasses . . . While digging my fifty-two bushels of potatoes, and gathering my pumpkins, etc., etc., my thoughts were *far, far away!* . . . On the 28th of July my husband was *mortally wounded* . . . In doing for my little family, I hope I am serving my country as every patriotic woman should do, in trying to raise food for the "thousands in the field," and the thousands more to go.

It has generally been true that in wartime the greatest demands have been for fats, grains, livestock, livestock products, and vegetables, with moderately increased demands for fiber plants. The stimulation of farm business plus currency inflation has brought apparent prosperity, but the improved financial condition of the farmers has often lagged behind that of the manufacturing and commercial classes.

The Revolution and the Civil War were fought when machines were fewer, distances greater, and pioneer individualism in the ascendant. Total war, as the term is understood today, would have been impossible, yet even then it was thought necessary to attempt price control or adopt similar economic measures. The success of these steps was almost nonexistent. The majority of people did not see that, when a nation was fighting for its life, *laissez faire* was something less than a blessing, and that a man might serve his country by simply refraining from charging all the traffic would bear for his

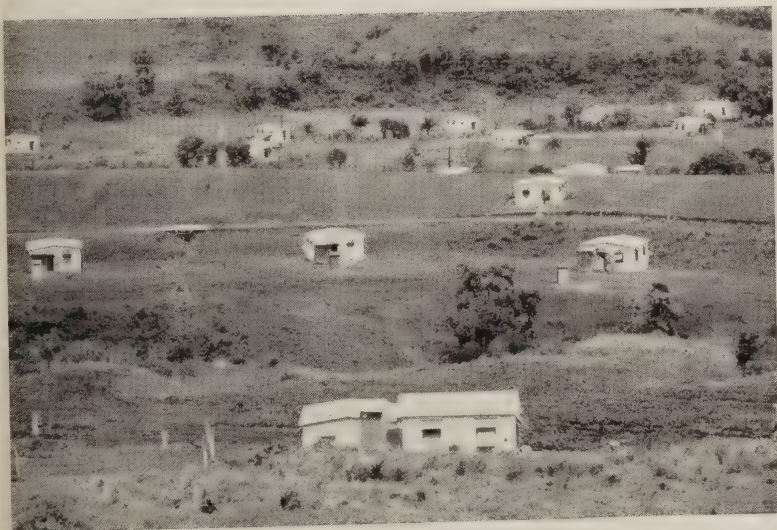
products. The failure of governments to cope with problems of distribution and price stabilization confused the war effort, and in the case of the Confederacy, contributed to final defeat.

The earlier wars erected to their own memories no such monuments of destruction as the Dust Bowl, erected by World War I. In the earlier periods there was still plenty of virgin land left to be exploited. In 1934, the dust that sifted down into the Atlantic after its air-borne journey from the Great Plains gave impressive warning that in future wars the margin of increased production would have to be drawn from reserves of fertility built up by conservation practices, rather than from unbroken prairie sod. On the other hand, the wars before 1917 offer examples which we in this war would do well to follow.

Tidewater Virginia shifted from the unprofitable production of tobacco to wheat cultivation in the Revolutionary era. The change from wheat to animal industries began during the Civil War on the overcropped fields of southeastern Wisconsin. The defeat of the Confederacy and the subsequent return to cotton cultivation should not obscure the fact that during the Civil War the change from cotton to foodstuffs was successfully accomplished in the South. These are object lessons for modern farmers of the wheat and cotton belts now that the demand is for animal products, diverse vegetable oils, and vegetables, rather than for their traditional articles of cultivation.

PUERTO RICO MEETS THE CHALLENGE OF WAR

BY G. L. CRAWFORD¹



A sample of the resettlement homes of the P. R. Reconstruction Administration.

Puerto Rico, Atlantic outpost of the United States, is recognized as the place where agriculture is handled more intensively than anywhere else under the American flag.

The Department of Agriculture, without knowing that it was preparing for war, has been planning programs there for a number of years; its problems were to cope with mountainous slopes, to produce crops, and to develop agriculture generally. It may now be asked, is Puerto Rican agriculture ready for an emergency—can it rise to the dual needs for expansion and intensification? In this article I touch on a number of the important institutions and analyze some of the factors now coming to the front in agriculture's war program.

The Insular Department of Agriculture rooted early, and it has always cooperated closely with the Federal and Insular organizations. The Federal ex-

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periment station was established at Mayaguez in 1900, serving mainly as an outpost for scientists from the Department of Agriculture. The Insular experiment station was set up in 1910 at Rio Piedras. The land grant college, created in 1909, opened its doors for students at Mayaguez as a branch of the University in September 1911. Its functions are similar to those of a land grant college in the States. It is training young men to grapple successfully with the agricultural problems of a densely mountainous, tropical, agricultural island. Many of the local graduates handle their own farm operations or are employed by the Insular or Federal Governments. A number of the graduates each year find their way to colleges in the States for advanced work. After completing such work they usually return to Puerto Rico, where many of them become leaders along the line of their training.

The Extension Service and Vocational Agriculture, in addition to the teaching of adults, are instructing more than 10,000 boys and girls in a better way of farm life.

During the last decade, largely because of the depression, there has been an increase in the number of Federal agricultural agencies. The Puerto Rico Reconstruction Administration has been a pioneer in actively stimulating the social as well as the economic aspects of agricultural betterment. It has purchased land and built more than 5,000 homes for resettlers. This organization has fostered the construction of hydroelectric water power, cooperative marketing, tick eradication, soil conservation, new industries, and many other worthy enterprises. Other agencies coming in subsequently have taken over many duties formerly performed by the PRRA, which has gradually tapered off much of its work.

The Works Progress Administration arrived in Puerto Rico three years ago and is now carrying on much of the load once borne by the PRRA, especially road building and defense activities. It employs at times 40 or 50 thousand people.

The Forestry Service has established a forest research station, handles two Federal National Forests and cooperates with the Island government in maintaining and developing a number of insular forests. The Service develops mahogany and fast-growing trees on a large commercial scale. It is also working effectively with several hundred individual farmers by putting them in charge of small forest areas and supplying them with homes in the mountain areas where they can produce a subsistence living on a limited acreage, and can earn cash during the year through sale of charcoal made from the trees thinned out of the forest.

The Agricultural Adjustment Administration

came to Puerto Rico in 1934 and started the sugar program. In 1936 it broadened its objectives to include and stimulate the conservation of soil by cultivating the land on the contour and by growing leguminous crops. Recognizing the importance of food crops for present and future needs, the AAA adjusted its program to the extent that plans now call for the planting of food crops for human consumption on at least 20 percent of the cropland on the farm, excluding sugarcane and orchards. The minimum requirement is one-tenth of an acre and the maximum requirement 25 acres devoted to this practice in 1942. The sugar program this year includes the growing of leguminous crops suitable for human consumption on 7 percent of the cropland operated by sugar producers. The AAA hopes by such emphasis to help meet the pressing needs of the people of the Island for home-grown foods.

The Soil Conservation Service came in 1936. At once began many soil conservation demonstrations which showed the farmer how to prepare his steep land for cultivation without inviting soil losses. A five-year land use program was worked out by SCS technicians in cooperation with 5,000 landowners. The SCS also cooperated with county agents and vocational teachers in demonstrations and in the development of soil conservation practices on the nine demonstration farms of the Extension Service and on the 116 vocational school farms. AAA and SCS activities in Puerto Rico have made farmers conscious of the importance of conserving soils on mountainsides, and have shown what can be done toward that end.

Farm land bank, intermediate credit, short-time credit, and emergency corp loans have all functioned satisfactorily in Puerto Rico for a number of years. Tick eradication has been successfully carried on cooperatively by the Bureau of Animal Industry, the Insular Government, and the PRRA, 80 percent of the work required to eliminate the cattle fever tick from Puerto Rico having been completed.

Youngest organization in the island is the Farm Security Administration. FSA brought its tenant purchase program to Puerto Rico in 1938. In September 1941 the rural rehabilitation program followed. The Tenant Purchase Division of Farm Security has enabled more than 200 farmers to purchase farms and to construct houses and farm buildings. The Rural Rehabilitation Division has loaned funds, with which to purchase equipment and to make a crop, to tenant-purchase borrowers acquiring farms. Only one TP borrower has failed to meet all obligations. Rural Rehabilitation has gone further, has made victory loans to 3,600 small farmers in distress and in some instances has made small grants.



This Puerto Rican mountainside will "stay put." Contoured pasture in foreground; cultivated land, operated on contour, higher up. The sodded ditch takes care of excess water.

The Insular Experiment Station at Rio Piedras has many accomplishments to its credit; for example, the development and improvement of sea island cotton. The Station has developed a strain of cotton that has a staple length of two inches or more, with excellent strength and character. The Federal Station at Mayaguez works on problems which affect the States as well as the Island. It has imported numerous plants of economic value, including quinine, and plants that produce essential oils for medicinal and perfume uses.

There are many other agencies in Puerto Rico that have done research and semi-research work on some phase of farm life, that are contributing to the betterment of the country. All these various organizations are not only meeting the challenge of the war, but doing so as a united group. Duplication and overlapping of work is avoided, teamwork achieved, by the cooperative effort of the local government headed by the Island Governor and the USDA War Board composed of 10 heads of Federal agricultural agencies.

By way of summarizing, Puerto Rico is meeting the impact of the war problem because it started a number of years ago to improve agriculture in general. The Island has developed local agricultural

leaders through its agricultural college. Agricultural Extension Service and Vocational Teaching have carried on educational work in agriculture, training boys and girls—and also fathers and mothers—in the better way of rural life. The agricultural experiment stations have developed new crops and have led the way for a more scientific agriculture. The AAA and the SCS have made farmers conscious of the waste they were causing through the practice of running crop rows up and down the mountainsides. Now, when farms expand to increase food crops, there will not be any large areas extremely damaged due to hazardous methods, such as occurred in the western part of the United States during the expansion of production during World War I. Farmers will be careful to use conservation methods. With credit organizations established and Farm Security facilities at hand, there is no reason why all strata of farm life cannot be supplied with the funds needed to grow food crops and to build better homes.

By having laid a careful groundwork of preparation, Puerto Rico is now ready and willing to meet every condition that war may bring with enlightenment and with courage.

CONSERVATION FOR TODAY AND TOMORROW

BY H. H. BENNETT¹

Good agricultural land is the most important of all man's material possessions. From pre-historic ages to the present—during all the countless centuries of man's upward struggle—human beings have lived altogether or chiefly from the products of the land. From the land they have taken their food and shelter and clothing. Thus it has been, and thus it will be, as long as human life remains on earth. Land—good land—is fundamental to the needs of man.

This has never been more true than today. With the world more nearly completely embroiled in war than at any other time, our soil becomes more necessary to existence than ever before. Good land is important at all times, because it is the source of human sustenance and security. In time of war, good land is as essential as good guns and ammunition.

Today, in the year 1942, the land of the American continents is vital not only to us who live here and work this land—it is of vital importance to all the nations and peoples of the world.

It is to this land of ours—billions of acres of cropland, grazing land, and forests, stretching from Hudson's Bay to the tip of Patagonia—it is to this land that the embattled democracies look for salvation.

They look to us in America—and when I say America, I mean all of us from the Arctic to the Antarctic—for many things: for leadership and moral support, to some of us for men and guns and ships and planes and tanks. No less than these, they look to us for food to give them strength to fight and survive in their dogged war against the enslavement of mankind.

We *dare* not fail them, for all of us here in America are in this war to some degree—officially or unofficially, actively or passively, actually or in effect. And we are the only nations who can supply these needs. We are the only ones who have the land and all the other requisites to do this gigantic and essential behind-the-lines job of farm production.

Importance of the Productive Lands of the Americas

Only in America—North America, Central America, and South America—is there the land, the manpower, the will, and the means to assume this task.

Only the Americas have the resources to do this job today, *and to keep it up for years to come*, as we shall have to do since our production job here in America won't stop with the signing of the peace treaties.

In the years that will follow the armistice—and nobody knows how long that may be—America will have to help feed the world. The occupied countries today are reduced to economic and physical slavery; industry and agriculture are in shackles, and all the resources of the vanquished nations are exploited by the invaders.

Peace will not magically restore those ravaged lands to productivity, the ruined farms to prosperity, nor gear the war plants to peace production overnight. It cannot by a few strokes of a gold pen give back normal living to all who have felt the oppressor's heel. We in America shall have to help in all these things.

We shall have to help business in those countries to its feet through the orderly processes of normal international trade. And before the agriculture of the occupied lands can regain its old efficiency, we shall have to help feed the people of those lands. We shall have to be the larder, not only of democracy, but of most of the world, for a while at least. Our land, our acres and hectares of cropland and grazing land here in the Americas will have to do this job. We can do no less, for that is what this war is about: It is a war of survival and for the maintenance of a virile civilization that reckons with the welfare of all people and the brotherhood of man. And we shall not let our brothers want.

We have the land to do this job — *if we use our land wisely*. We Americans are among the richest people in the world today in agricultural resources, but I regret to say that we have not always used those resources wisely. I know that we at home in the United States have not done as well as we should in this respect.

In the early days of our country there were not many people and there was a great deal of fine rich land. The first few thousands of people and those who followed them to North America thought they had come to a continent of inexhaustible land—land that would never give out. So our forefathers used the land carelessly, and as each new generation rose it followed in the footsteps of the elders and continued the mining and abuse of the soil. This was not done with deliberate disregard for the outcome,

¹Chief of the Soil Conservation Service. Address before the Second Inter-American Conference on Agriculture, Mexico City, July 6-16, 1942.

but because of failure to realize what the result would be and because of the belief that there was plenty of good land.

Carelessness in the Use of Land

The results have been serious, and for a great deal of land they have been tragic. Some of our farm lands that once were among the best in the United States have been ruined. But we know now what our mistakes were and how to avoid repeating them. And we have learned as a result of years of study, research, and farming experience how to protect the land and how to go about restoring some mis-used portions of it to productive utility.

We have learned more than that: We have learned that the same things which help to restore damaged land and which enable us to cultivate the soil without damaging more land also help us to obtain increased yields of grains, vegetables, fruits, forage, and animal crops.

In other words, we have learned that conservation of soil and water resources pays big dividends not only in the preservation of our cropland and grazing land but also in better production from those lands.

We have found, for example, that we can greatly increase the per-acre yield of corn through farming methods that conserve soil and rainfall. In the State of Indiana two adjoining fields were tested. One was put under a five-year rotation of corn-corn-soybeans-wheat-clover with fertilizer and manure added. The other field was not treated. The average yield over an 11-year period was 64 bushels of corn per acre as compared with an average of only 39 bushels per acre for the same period from the untreated field of similar land.

In the State of Iowa cornland farmed on the contour—on the level, around the slope—produced 56 bushels of corn per acre as compared with 33 bushels from similar adjacent land on which the corn was planted up and down the slope.

But I want you to notice particularly that first example in which the yield of corn was increased by the simple conservation method of crop rotation. I want you to pay special attention to that because it is extremely significant.

As you know, greatly increased production of many farm crops, including corn, is needed now to meet the additional demands resulting from the war. Now, laying out contour lines and contour strips requires a certain amount of preparation and time, and building terraces takes even more. If we grew most of our corn on sharply sloping land and had to terrace it before we planted corn, we could not

in the short time available produce all the corn that's needed. However, that is not necessary. By growing corn on land that is level or practically level, and by using such simple conservation practices as liming, fertilizing, and manuring the land, we can locally increase the yields very easily and thus produce the additional corn we need for the war effort.

Increased Production Through Conservation

Perhaps I should emphasize here that conservation is not entirely a matter of physical works such as terraces. Terraces are *soil-protection* measures; they increase and maintain yields by holding on and in the land the rich growth-promoting topsoil and the water from rains.

Such simple practices as liming, manuring, fertilizing, and crop rotations, are *soil-maintenance* measures. And it is an essential part of a thorough farm-conservation program to maintain a favorable soil structure as well as the fertility of the land. All cropland—level as well as sloping—must be maintained, if it is to continue producing big yields.

What we have been able to do with corn, we have done also with other important crops. We have found that potato yields can be increased by conservation farming methods, and cotton, and fruits. Such a simple practice as mulching, used alone, has resulted in marked crop increases in numerous instances.

And by careful management of grazing lands we have been able to increase the production of beef. Production of milk has been increased simply by rotating dairy herds on pasture land. Some of our farmers have increased their pork production very inexpensively by fattening hogs partly on legume pasture instead of entirely on corn. And the legumes improve land where corn tends to exhaust it.

Let me cite another example: One of the great needs of the war is for large increases in vegetable oils and fats. Soybeans constitute one of the temperate zone's most important sources of vegetable oils. Farmers usually have grown soybeans in rows drilled far apart and cultivated like corn. We used to think they had to be grown that way and we regarded the erosion frequently resulting as inevitable—as something we couldn't do anything about.

Now, through research and experience, it has been proved that by drilling the soybeans close together erosion has been practically stopped and better yields obtained at the same time. It is simply another case where soil-conservation measures have increased crop yields while protecting the land.

All this is very good news for the United Nations. It is of extreme importance because it is the only way that we in the United States can meet the heavy war-time farm production goals we have set for ourselves. It cannot be done by the old, outmoded farming methods of yesterday. And even if it could, it would be only at the grave risk of damaging more valuable land, some of it beyond the possibility of practical restoration.

Erosion is Widespread

Unfortunately, this situation is not peculiar to the United States. There is erosion in varying degrees throughout America, as indeed there is throughout most of the world. I have traveled in several of the South and Central American republics, and the United States Department of Agriculture, at the invitation of some of the other American governments, has sent missions into some of those countries to study the erosion problem and other agricultural matters. Toward the end of 1941, I went with several other men from the Department of Agriculture into Venezuela for such a study.

These countries, like other American nations, suffer from soil erosion. For example, erosion is particularly bad in the northern and eastern parts of Venezuela, especially in the mountain sections, where there is severe sheet washing and gullying. I am happy to say that the Venezuelan government is making an intensive study of the problem and taking steps toward its solution. In Colombia—where there is also a big erosion problem—one very fine thing provided for is the establishment of “protected forest zones” where lumbering operations may be carried on only under government supervision. Colombia also is establishing state nurseries to aid in the reforestation of denuded areas.

There is severe erosion in parts of Brazil, also. In the central part of the State of Minas Geraes the problem has become serious since agricultural expansion has caused the clearing of much forest land. And reforestation has not been carried out adequately. However, demonstration and experimental work on erosion control seem to be getting under way. Slight to severe erosion has affected about half the farming land in Sao Paulo province, where the mechanization of agriculture has advanced further than in most other regions.

Chile, too, has its erosion problem, and its frequent accompaniments of drought and flood. There are few forests in the northern Chile valleys, and this results in tremendous floods and the loss of a great deal of topsoil. Often this topsoil, washed down from upland farms, is carried into reservoirs, some

of which have been ruined by sedimentation. An example is the reservoir above Pangal Dam, in Cochapoal. This was completely filled with silt in about nine months. Other sections of Chile suffer from erosion, too. The government already has taken steps to alleviate the situation. The control measures include tree-planting on marginal farmlands; changes in agricultural methods, particularly in the arid areas; and encouragement of cattle raising in the humid zones. Soil-building and tree-planting are somewhat difficult in the drier areas where droughts are frequent during summer.

Argentina has some serious erosion. Wind erosion is a difficult problem in the semiarid middle west—the eastern section of La Pampa, southeast of Cordoba, and west of Buenos Aires. Serious erosion by water is seen in areas of abundant rainfall where there has been too-intensive cultivation and grazing of steep slopes. And here again the government is tackling the problem in businesslike fashion, I am informed, by establishing a soil-conservation program.

In Peru, while there is considerable severe erosion locally, the situation is somewhat different. Hardly enough rain occurs in some parts of the country to cause serious erosion, and there is comparatively little forest land to be preserved. In some of the more thickly settled portions of the low-rainfall regions conservation becomes largely a matter of saving water for irrigation along the streams, such as those traversing the western desert areas.

Water for irrigation is obtained frequently by pumping it from depths of 50 to 500 feet under the surface of the principal river valleys. Peru also is experimenting with diversion of flood waters from the rivers to irrigate suitable adjacent lands. If these trials prove satisfactory, it has been predicted that farm production on irrigated lands may be increased by a third and that portions of present desert areas may become croplands.

It may be of interest to quote a few excerpts from a report by some of the specialists of the United States Department of Agriculture who made a study of land and agricultural conditions on Ecuador:

“Intensive cultivation, particularly on the very steep mountain slopes, has contributed to much soil wastage from erosion,” the report says. “This erosion is due to wind as well as water, but with the exception of a few of the arid regions where the soil is very light, water erosion is the most severe. Runoff from rain and poorly controlled irrigation water has caused severe damage and fields may often be seen where the top layer of dark humus-laden soil has been entirely removed and the land has had to be abandoned. . . . In areas where there is only

a thin layer of organic soil covering loose sandy material, and where dry farming methods are practiced, wind erosion causes severe damage on exposed areas. . . . Examples of almost total destruction of land by water erosion were seen near San Gabriel in Carchi Province, at Ambato in Tungurahua Province, and at Guamote in Chimborazo Province. Severe wind erosion was seen near Latacunga in the Province of Cotopaxi, at Riobamba and Palmira in Chimborazo Province, and at Cañar in Cañar Province. This wastage of land naturally throws an additional burden on that yet remaining, and one of the greatest problems facing Ecuador in the future is that involved with finding adequate land resources to support the population."

It has been estimated that in the inter-Andean section of Ecuador, approximately 75 percent of the land originally in cultivation between Loja and Cuenca, along an airline distance of about 150 kilometers, has been abandoned because of erosion. Only about 3 percent is now in cultivation. Here many of the slopes are very steep and they have been cultivated for several centuries.

In Mexico erosion is a serious problem in numerous localities, particularly on the steeper slopes that have been under cultivation for some generations. In various localities overgrazing has started some severe washing. One of the most violently eroded sections is in the hill country surrounding Lake Patzcuaro in the State of Michoacan.

It is interesting that in some parts of Mexico, farmers have long practiced the building of stone fences across slopes approximately on the level, apparently to catch soil moving downhill under the impact of uncontrolled runoff from rains. After a time this practice has brought about the development of bench terraces of a decidedly stable nature—pretty nearly secure against erosion. Something of the same kind has been accomplished in some fields with contour plantings of maguey.

Again, there are areas in northern Mexico where grazing has not been severe. Some of these localities have the best natural grazing lands to be seen anywhere under low rainfall conditions.

The problem of erosion is reported as serious in some parts of Chile and Uruguay. In the West Indies, much land has been severely impoverished—in Puerto Rico and Haiti, particularly. Certain parts of Cuba have suffered, but in that country considerable land is highly resistant to erosion because of the nearly level surface and the high capacity of the lataritic soil for absorption of rainfall.

In various parts of the Western Hemisphere the rates of erosion have been astoundingly rapid because of the torrential character of the rainfall, high

susceptibility of the soils to washing or blowing, traditional supposition with respect to a superabundance of productive American soil, and lack of information on and interest in the subject. Probably no race, civilized or barbaric, has wasted productive agricultural land so rapidly as we Americans have wasted land in many localities and over some large areas. We have not set about to do this wilfully, of course. We just haven't thought about what we were doing, that is, not enough of us have thought about it.

Conservation work for the control of erosion has been practiced in various parts of the world almost since the beginning of agriculture. In the Andes the Incas established a stable bench agriculture, much of it provided with irrigation, that represents one of the best pieces of engineering works ever accomplished by man. On some of the steeper slopes, rock-walled terraces perhaps 6 or 7 hundred years old, possibly two thousand years old, are still holding and some of them are still used for crop production. These were built at great expense, at a cost amounting to \$18,000 an acre, as computed on the basis of prevailing prices of labor in the United States.

When I say that we have permitted erosion to get ahead perhaps faster than in any other extensive part of the world, I do so with the knowledge that great civilizations have been effaced from the earth because of soil erosion.

This assertion is not made out of thin air. We have looked into the effects of erosion in some of the older parts of the world; we have surveyed the ancient lands extending across North Africa and on across the region known as the "cradle of the human race" into the country east of the Euphrates. Dr. W. C. Lowdermilk, of the Soil Conservation Service, had completed this survey when World War II broke out. In his reconnaissance great areas of land were found ruined by erosion—land that formerly supported dense populations. In places not only was the land stripped of its topsoil and horribly gullied, but the subsoil had washed off to bedrock. Archaeologists, working in those regions of devastated land, often have to dig deeply to reach the tops of buildings of the dead cities they seek to study, as at Babylon, Khorsabad, and Antioch. At Antioch, Syria, where St. Paul struggled so valiantly to gain recognition for the Christian religion, it was necessary to dig down 18 feet in parts of the city in order to reach the magnificent structures of marble that the Apostle knew.

Had to dig through what?

They had to dig through accumulations of the products of soil erosion—the very substance of the land that made it possible to build the cities, wasted

and misplaced by the action of water and wind.

The land is gone. The people are gone. Great civilizations have disappeared from the earth: Babylonia, Assyria, and others. The remnants of the peoples of some of those wasted areas are still to be seen wandering about in search of water and grass for their flocks.

But the people of those civilizations used their lands for centuries on centuries—for thousands of years—while some of us in parts of the Americas have used up within a single century enough good land to support whole nations. And the unnecessary devastation is still going on in too many localities.

After the War

After the war are we going to return to or hold on to our old ways of wastage? Or are we going to make up our minds to pull out of this slough of waste—get under way a program of soil defense that we shall not under any circumstances permit to be postponed? We've waited too long already. The job is vastly more difficult now than it would have been had we started a program a hundred years ago or even at the close of World War I.

Can we have a permanent agriculture on the more-sloping lands of the Americas without an active, continuing, and sound program of soil and water conservation, supported determinedly by all the people?

I think the answer is No.

And people cannot always have security merely by passing laws, issuing regulations, building institutions of learning and public edifices, or debating social and economic affairs.

There must be development of a public conception of the indispensability of productive land, such as will demand a continuing program of work that insures adequate protection of the land.

What Is It Man Has Overlooked?

Strange how so few of our great men—our historians and economists, scientists and professional men, statesmen and teachers—have recognized the full economic and social impacts of unrestrained soil depletion and unwise land use. The ancients knew about the problem, and in various parts of the world their conservation efforts are extensively written on the ground in the form of rock-supported terraces or the remnants of engineering structures employed in their agricultural operation. But these records have not been written into our histories, not even in our volumes on economics and agricultural techniques.

Now and then individuals have done outstanding soil conservation work. Some have recorded their practices and results in the literature. But the number has been too few, and for decade after decade not much was done beyond these individual accomplishments.

Too generally, I am afraid, public statements and proposals about the causes and cures of world tribulations—words that catch the signboards of the times—contain too little about this orgy of waste that began in ancient time and brought on repeatedly misunderstandings, raids, and wars between neighbors and communities and between regions and peoples. Men have been making and talking and writing about these well-meant proposals down through the ages, from before the time of Christ to the issuance of the latest daily paper. But what has come out of all this study, public discussion, and law-making about new ways for directing the affairs of mankind?

They have done good, no doubt—helped to hold things together here and there for a time. But they have not solved all the pressing problems. They have missed something. We now have spread across the world—in the year 1942 A. D.—the most dangerous of all wars.

What is it our leaders have missed?

It is my belief that they have overlooked the greatest fundamental force for good—for good to all the people of the world. Seemingly, they have left out of their considerations the fundamental significance of productive land—its utter indispensability to the welfare and brotherhood of mankind.

Significance of Productive Land

Working out on the land with many kinds of people and appraising the relation of productive soil to the welfare of the farmer and general public, my years of experience studying the lands of the United States and various countries in South and Central America, and elsewhere, have led me to the belief that men come to a better understanding of one another under such surroundings and circumstances. Out on the land there seems to be a kind of common denominator that influences men. Perhaps this intangible thing awakens a common conception of the close relationship existing between man and nature or the complete dependence of man upon nature—upon productive soil, the mother of us all.

Accordingly, I propose that in our national and international affairs all of us here in the Americas undertake to make greater use of this good will to be found in productive land.

Consider, for example, the effects of the soil and water conservation work carried out on the Elm

Creek demonstration project near Temple, in the Black Belt of Texas. Here, in a solid block of 34,000 acres, 174 Texas blackland farmers in the watershed of North Elm Creek have completed a job of soil conservation that is attracting world-wide attention. With practical farm measures these operators are holding back much of the rainfall that used to run off the land, sweeping away productive soil and cutting fields and pastures into a waste of gullies.

This is the largest cooperative effort of its kind that has ever been carried out in the United States or anywhere else that I know about. Across the 174 farms every acre of every field and pasture, and every wasting gully has been treated for conservation. It is most spectacular, visually and in measure of results attained. Its zebra-striped patterns of conservation field measures wind becomingly around the slopes and valleys without regard to fences or property lines. Air passengers note this as they fly overhead.

Here is real conservation—safe and rewarding production through scientific measures technically applied to the land. What it really amounts to is selective service for each acre of land: that is, use of the land according to its needs and capability to produce.

Demonstrating Erosion Control

By petition of the farmers themselves, the Elm Creek work was started as a demonstration of practical ways for conserving soil and rainfall, back in those pioneering days of 1934 when soil conservation as a regular part of farm practice in the United States was comparatively unknown and untried. The original cluster of demonstrating farms expanded as the work progressed—as the strip crops and terraces and contoured rows crept across fields to protect more and more of the eroding slopes. As benefits became manifest, soil conservation spread out in every direction—a farm here, a small group of farms there. The demonstration became an example not only locally but throughout the famous blackland belt of Texas, and indeed throughout all of agricultural America and many distant parts of the world.

Some six hundred farms—613 to be exact—eventually joined in the demonstration work, which covered the 206,000-acre watershed of Elm Creek. These farms were all completely treated, according to need and adaptability. After the original work was under way for some time the farmers saw what it meant, the people living in the tributary watershed of North Elm Creek asked to have the work extended to their neighborhood.

It was about 60 to 70 years ago that the virgin prairies of central Texas, richly clothed with little bluestem and other native grasses, first felt the prick of the plow. But before these farmers of the Black Belt started in for soil conservation, nearly every hilltop stood out conspicuously with telltale splotches and streaks of cream-colored subsoil. Rich black clay land still followed the lower slopes and stream bottoms, but from fields on the upper slopes the dark topsoil had been floating off in the drainage waters from the successive rains of generations until lighter colored subsoil of chalk and marl began to show at the surface. Farmers finally sensed that they were losing their principal capital—their productive topsoil. But until they got together and worked with the erosion specialists, they apparently felt helpless to deal with the problem. The usual practice was merely to devote more eroded fields to oats and sorghum, while letting the cash crops—cotton and corn—have right-of-way on the less eroded flat lands. This really was about the same as doing nothing to hold back the flood tide of soil wastage.

These farmers had been accustomed to planting their crops in rows that ran up and down slopes. That was bad practice. Water, concentrated in the gutter-like furrows between the rows, swept away soil from some fields almost as fast as the farmers could have hauled it away on trucks. And there was sheet erosion over entire fields with every heavy rain.

In Texas alone, within less than a hundred years of agricultural occupation, enough soil has been lost as the result of unnecessary erosion to support the people of Palestine for many generations. There have been wind erosion and dust storms over the wheatlands of the Panhandle; sheet washing and gullying over the vast central, southern, and eastern sectors; floods and washouts along rivers like the Trinity and the Brazos; and steady deterioration of the grasslands west of the Pecos.

The North Elm Creek project deserves the careful attention of all who are interested in permanent systems of farming and practical ways for getting such permanency. Here, soil conservation plans were made without regard for county boundaries or even farm boundaries. The prime consideration was to protect the land as a whole: to lay out the controls along natural rather than artificial lines. During the past 7 years farmers of this particular drainage basin have cooperated spiritedly with the technicians of the Soil Conservation Service, as well as with one another, in order to get complete control of wasteful erosion. Today the measures that have been used on the land are effectively holding soil and water on the 34,000 acres of these 174 adjoining farms.

With respect to production, the conservation work has resulted in greatly increased yield of cotton and an increase of more than 4 bushels of corn per acre as compared with yields obtained on similar farms of the locality where there has been no conservation work. The increased income has netted the farmer an average of at least \$2.50 per acre over and above that derived from surrounding farms.

One of the most significant features of the whole job has been the comparatively low cost of installation and maintenance. By building terraces across farm boundaries, farmers in the watershed have been able to eliminate a large number of drainage outlets that would have been necessary if each farm had been treated as a separate unit without consideration of the needs and relationships of adjacent lands. Where terraces met on farm boundaries, a joint outlet was built. Each farmer gave half the land needed for the channel; and both agreed to share the costs of construction and upkeep.

And these joint conservation operations are only the outward manifestation of a deep-seated spirit of mutual helpfulness that resides in North Elm Creek watershed. Probably nowhere has there ever been a more impressive example of neighborhood cooperation in the solution of a common land problem.

Many of the farmers entered into signed agreements with one another for permanent maintenance of the cooperative work—the work done along waterways and gullies and other places affecting farms that touch one another. I have been told that such agreements, if recorded at the Court House, would become permanent attachments to the land.

Men of Foreign Origin Work Together

The forefathers of these cooperating farmers came from Austria, England, Germany, Czechoslovakia, Scotland, France, and other old world

countries, but today they're farming the largest solid block of conservation treated land in the world to help produce the food, feed, and fiber necessary to defeat the Axis powers.

Their unrivaled achievement in planning and establishing complete conservation farming practices has been told wherever soil conservationists gather. Nowhere else in the world, to my knowledge, has there ever been a more impressive example of cooperation in the solution of land and water problems. I consider this one of the most significant jobs ever completed by mankind. Not even the building of the Pyramids can be excepted.

The work of the Mareks, the Frerichs, the Crenans, the Winkleman, the McAtees, the Klapkas, the Hoffs, the Monroes, the Pelzels, the Chernoskys, the Kahlers, the Watkinses, the Voltins, the Neinasts, and all the others who cooperated in this conservation project stands as a monument to the fundamental economic and spiritual meaning of productive land.

"I Am an American Day" was observed in the United States on May 17, 1942, under proclamation of President Roosevelt in honor of American citizens born in other lands. Most of the North Elm Creek farmers of foreign extraction, however, are native citizens of the United States, the sons and grandsons of men and women who came from the "old countries."

"We are ALL Americans here," the North Elm farm people will tell you. And they have proved it in scores of ways. Besides sending their sons to the armed forces, they have participated 100 percent in the aluminum and scrap-iron drives. They have overshadowed every quota set in war-stamp and war-bond drives. Several farmers have pledged \$500 per year in war bonds—for every year as long as the war lasts. One young man who was unable to pass the army physical test immediately put \$1,300 into war bonds.

To Be Concluded in September Issue

OUR TRAGEDY AND OUR HOPE: A Review of THE LAND

BY PHOEBE O'NEALL FARIS

This new film is a 45-minute-long dose of bitter medicine for the people of the United States of America. It tells the somber and true story of the fate of much of our soil—and many of our people—by way of ruthless exploitation of farming, forest, and grass lands throughout our agricultural

history. The motion picture, recently completed by the Agricultural Adjustment Agency, has been distributed for non-commercial showings. Its purpose, apparently, is to cure by torture, like sulfanilamide; to cure us, all of us, city people and country people, of indifference or arrogant disdain, as the case



"Along our highways there are more than a million homeless people. We came to this family moving out. The land had played out on him, he said. Most of our migrants are young people with young children. We had another name for these people once. We called them pioneers. Heading West—that's where most of them go."

may be, by flashing before our eyes some of the most completely devastated lands in the world, and old people, little children, middle-life people, ill, bitter, and disillusioned, wearily trudging the never-ending road, retracing, foraging like refugees from the horrors of an invading ferocious army, all going nowhere in search of somewhere and peace. These are real people and this is actual torn land within our own borders. We can take it or leave it, but we had better take it.

The Land is not a faked motion picture, nor is it acted. The slashed and hacked gullied land of the once rich Southland is real; the aged negro, a dark ghost in the doorway of the ruined mansion, is real; the boy "picking peas" in fitful sleep, the tall man with the unforgettably hopeless face left alone with his brooding thoughts—these are real people. These are our problems; ours because we are Americans and have only ourselves to blame. We must face these problems and go all-out to solve them now,

even in the midst of our greatest emergency, total war against foreign evil. We have always done things in a big way—why not take all our bitter medicine in one dose?

I sat alone in a dark, stuffy room in the bottom of a mammoth building, on the first hot day of the year, for a showing of *The Land*. This was a peculiar experience. I went home slowly, thoughtfully, pondering the United States of America, the portion of Earth and the people for whom we are now fighting with all we have. I knew that hot day, as I know now, that soil conservation is rapidly becoming one of the "big things" in this country, that nearly half a billion acres of our land, in 41 States, are now covered by soil conservation districts; that six million farmers are "on their toes" to our land problems and are energetically going about the business of installing soil conservation systems on their farms. I know that this figure does not include the many thousands of farmers in between the districts who,

because they love their land, because they are true husbandmen, are setting up soil and water conservation practices without government or State or other aid, using the simple means they have at hand and their knowledge of natural laws and functions learned through close association with the soil and the water courses, plus information gleaned from the farm paper and Department of Agriculture and experiment station bulletins.

I knew that day that the people who made *The Land*, the new documentary film I had just seen, those gifted people were quite as well informed as I—and far better—about soil conservation being a big thing in this country today. And so I was puzzled in my mind for some time as to why *The Land* had made me feel that—for all our efforts during the last decade, for all our spread-of-practices that now reaches from border to border and sea to sea, to Africa, to Australia and other far lands, for all our mammoth war production program, launched with high hopes and already going full swing—we have very little good land left in the country!

But this was absurd and I knew it. Why then, had *The Land*, beautifully filmed by Robert Flaherty, a great artist and famous motion picture photographer, with Russell Lord's fine Prose, why had this film sent me into the depths as no Hollywood-made movie ever could? It was because of the people! We can "fix" our eroded and spoiled lands, and we will. But people are not so easily "fixed." Those people, many of them, probably most of them, dislodged from the land by the suffering land itself—bared and gashed hills, wind-battered plains, cotton lands riddled by cotton, even the tall-grass country denuded of its tall grasses—those people must be returned to the land and they must be shown the straight-and-narrow, the right way to use the land, and must not be allowed to deviate from that way. I thought of farm people I know, proud to work together for community values, especially proud and happy to pool their means and their labor and their knowledge to improve their farms and community standards; yes and often to lift up the "lost" farmer who happens by, down and out . . . For two years I have watched this regeneration of a "lost" farm family, by friendliness, in a small-farm area of the East. The results are something to lift up the heart to the high places. Let us suppose, as we ponder the so-called "migrant" problem, that the farmers of the country were given the chance, the privilege, of reclaiming lost farm families along with lost farm land—say three families to a farmer group, a soil conservation district for example . . .

The Land has much to say, pictorially, and dramatically, about giant machines on the land, felling

trees, picking more cotton in 20 minutes than a man can pick in two days, harvesting corn and even carrots, stripping the plains of cover; and about great ships with cargoes of wheat from our plains and sheep from our ranges, setting sail for other lands needing bread and mutton. This part of *The Land* works "contrariwise" with other parts, for here the tremendous productive capacity of our country is emphasized—and one has the fleeting thought, as the picture grinds on, that this film would drive Hitler crazy—crazier. He would no doubt order his best agents to find out at once—or else—what it is the Americans use in place of soil!

The purpose of this documentary film is of course, to show what can happen to the land—what has happened to our land and our people—once human beings start digging and keep on digging for 2 centuries, with ever larger tools and ever more human beings, without definite plans to conserve the soil and human resources. *The Land* does tell this story, as regards our country, most effectively by means of some truly magnificent photography, a commentary so simple and moving as to be powerful, and music flowing along like a river. When, near the end of the film, the new pattern of land use—soil conservation—is introduced, the contrast is so striking that it almost approaches the melodramatic. Rich moist soils, properly worked; contour cultivation, and forests guarding the slopes; clover, lime, health; farmers talking it over, a new shining light on their faces; giant machines under control on the land; snug, happy homes amid lush green pastures. . . .

The mental reaction is tremendous, here at the end of *The Land*. What a difference soil conservation makes—the land made strong again—the light in the peoples' faces.

HELPS ARMY HOLD LAND

(Continued from p. 29)

ton, Spokane, Wash., now at Salt Lake City; Walter Kell, Lincoln, Nebr., now at Omaha; Sid Parish, Lima, Ohio, now at Columbus; and E. C. Murdoch, Upper Darby, Pa., now at Baltimore.

Two of these men have been commissioned. The others are being transferred to Army pay rolls effective July 1, 1942 for the duration. Doctor Bennett is anxious that they be given all possible assistance by Service technicians in carrying out their assignment. The Army's job of turning out millions of fighting men is a tough one, and if the Service can assist by handling erosion and revegetation problems, we are not only saving soil but helping the Army officials by allowing them to devote more time to training the fighters who will protect our soil.

For REFERENCE

Compiled by **ETTA G. ROGERS, Publications Unit**



Field offices should submit requests on Form SCS-37, in accordance with instructions on the reverse side of the form. Others should address the office of issue.

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Cassidy's field had about the same slope as ours. It had cotton on it that year and the rows were run up and down the hill. Between each row there was a little stream of water. You could see the streams all the way up the hill when the lightning flashed. Lower down and near the fence where we were, some of them had joined together to form bigger streams. I noticed that the little streams ran around the rows, but when they had joined they cut across and washed out the whole row. Some of the stalks of cotton, though they were knee-high, were washed out completely. All these combinations of streams headed for the lower side, where there was a gully.

"Now, let's follow the water," said the old man. We were soaked, but he didn't seem to know it was raining at all. We climbed the fence and followed the biggest stream that flowed from Cassidy's land a few hundred yards, and the gully got bigger all the time. There was a slope this far, but then the land began to flatten out, and a little farther on was almost level.

The gully got shallow and the water was spreading out all over the flat place. "Tomorrow if this keeps up there will be a layer of sand and clay all over the flat. You are seeing poor land being made poorer. Now let's go back and look at our field."

There was a good deal of water coming through the gully which ran up the draw. But there were dams to slow it down and by the time it reached the lower side only a little trickled through the rock wall by the fence. Little or none was running off the broken ground. It seemed to soak in instead.

Well, the old man stood there several minutes staring at those fields. When he looked at ours he seemed pleased, but when he looked at the deepening little gullies in between Mr. Cassidy's stunted cotton rows he got angry.

"These improvident farmers are ruining the land. Yes, ruining it world without end. The whole country is going to rack and ruin. The foundation of civilization is being undermined. There will come a time when conservation will be popular but it will be too late. When the farmers are pauperized this nation will face ruin."

From

OLD McDONALD

HAD A

FARM

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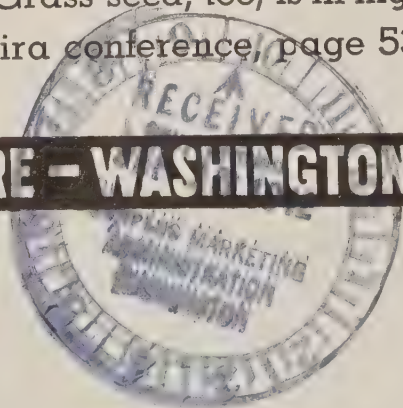


SOIL CONSERVATION

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

Conservation works for victory! With commercial nitrogen of vastly increased importance, farm fertilizers have a heavy-duty obligation: Read what R. H. Lush suggests, page 51. Grass seed, too, is in high demand: See the report on the recent Elmira conference, page 53.

UNITED STATES DEPARTMENT OF AGRICULTURE - WASHINGTON



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WELLINGTON BRINK
EDITOR

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SOIL CONSERVATION

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CONSERVE FOR PRODUCTION

BY R. H. LUSH¹

The recent creation of the Foods Requirement Committee of the War Production Board places new emphasis on being in time with enough. Eight years' experience with soil conservation methods will enable cooperating farmers to produce more of essential food and feed crops with greater efficiency. But higher feed prices, transportation difficulties, and labor shortage form a particularly acute situation for the livestock farmer everywhere. Surplus wheat or corn, increased national supplies of soybean and other oil meals, and the usual supply of hay may not be available where needed next winter because of freight congestion. Plans should be made to grow more feed where it is needed most—especially pasture, as it involves no cost in harvesting, processing, transportation, or storage.

Fertilizer tests on dairy pastures were conducted a few years ago in 15 Northeastern States. Superphosphate alone increased yields 34 percent; superphosphate and lime, 51 percent; superphosphate, potash, and lime 79 percent; and complete fertilizer and lime increased yields 138 percent. Nitrogen gave the added "kick" when large amounts of minerals were supplied. Milk yield per acre was doubled by the use of complete fertilizer. Results obtained in 103 tests in the same year showed an average of 1.7 extra pounds of protein from each pound of phosphoric acid used with potash and lime; and 3.1 extra pounds of protein from each pound of phosphoric acid used with nitrogen, potash, and lime. Crude protein was produced more efficiently from phosphorus used in complete fertilizer, and each pound of nitrogen applied was directly responsible for nearly 3 pounds of extra crude protein and about 10 pounds digestible nutrients in a very palatable form. Similar results have been obtained in the South and more humid parts of the West. A ton of average fertilizer will produce about 8,000 pounds of milk or 1,000 pounds of beef. With crude protein selling at over 5 cents per pound in its cheapest feed form, the fertilization of pastures and hay fields would seem to be the economical solution.

But while nitrogen is essential to most economical feed production, commercial nitrogen for agricultural use is limited until war needs are filled. Nitrogen should be grown and conserved as never before. Fortunately there are adequate supplies of 18- and 20-percent superphosphate, the recommended phosphate-potash, and some complete fertilizer grades for deficient soils, to grow increased acreages of adapted legumes where seed and labor may be wasted without fertilizer.

More legumes should be planted for grazing, ensiling, or turning under. More land should be made ready for alfalfa or clover. More cereals should be seeded for soil conservation and grazing; and still more clover and grass pastures should be started. A pound or two of Ladino clover seed ought to be added to every new seeding or pasture in the Northeast. Increased acreage of winter cover crops should be planted on all Southern farms; and adapted legume seed should be added everywhere if obtainable.

Best results usually are obtained from fertilizer applications at seeding time, or on the pastures in fall or early spring. But the war emergency calls for addition of the necessary plant-food on fields and pastures containing legumes as soon as possible. Legumes must be fed if they are to produce nitrogen to feed the soil, and in turn to feed the livestock. The 1940 census shows a National average of less than two acres of plowable pasture per animal unit.

¹ Pasture specialist, The National Fertilizer Association, Washington, D. C.

Pastures must be made productive for a longer time if livestock are to be better fed and more produce is to be obtained.

Several times as much nitrogen is lost through poor handling of manure as is purchased in fertilizer. An average ton of farm manure contains about 10 pounds of nitrogen, 5 pounds of phosphoric acid, and 10 pounds of potash. The amount produced annually per 1,000 pounds liveweight is about 15 tons by cows, 12 tons by horses, 10 tons by sheep or fattening cattle, 18 tons by hogs, and 4.2 tons by chickens. Sheep and chicken manure may be twice as high in nitrogen content as that from hogs or cattle. In the case of cattle and sheep, about one-half the nitrogen is in the urine. Probably one-half of the total nitrogen on the average farm is lost by leaching, use of insufficient bedding and through fermentation.

The use of superphosphate with fresh manure makes a more stable compound of the nitrogen, retards fermentation, and gives a better-balanced plant-food for most soils. The addition of 50 pounds of superphosphate to a ton of average manure makes it the equivalent of 167 pounds of 6-9-6 fertilizer. The superphosphate can be added in the gutter, floor pens, dropping boards in poultry houses, or over the manure pile or spreader load. Because of the rapid loss of nitrogen in the form of ammonia, the sooner superphosphate is added, the more nitrogen is saved. Use 1 to 1½ pounds every day for each cow, steer, or horse; ⅓ pound daily for each hog or sheep; 1 pound for each 100 hens. When superphos-

phate is not used in the stable, 50 to 75 pounds should be spread on each load of manure.

For sanitary reasons manure must be kept away from the milking barn but must not be spread on fresh pasture. Land that is to be plowed immediately offers the most efficient use of manure. But where there are limited amounts, it is now best applied at half the usual rate in order to give more land some nitrogen. Fertilizer applications with the new crop can help make up the difference this season. Old sod that has no clover left can thus be manured, fertilized, and seeded to a suitable grazing crop and then top-dressed naturally by grazing animals. If no crop land is available, manure should go on pasture land after it has been grazed off.

In winter or bad weather, manure should be stored under cover after reinforcement. Dragging pastures to scatter manure should take place after grazing. The plantfood leached out will be absorbed and used by the grass. One of the chief advantages of rotational and supplementary grazing, aside from even milk flow, is the opportunity it gives for more uniform distribution and utilization of manure. This is especially true now, with labor and nitrogen shortages. Livestock should be on pasture or grazing crops rather than in the lane, dry lot, or around water holes where the manure may be lost. Some manure conservation has been practiced since farming began, but never has it been so important as now. Nitrogen must be produced and conserved for most economical production.

CRESTED WHEATGRASS vs. FIFTH COLUMNISTS

Crested wheatgrass, of Russian ancestry, is one of our leading allies in this war. In a frontal attack on erosion, it has opened the way to making beef on worn-out and surplus wheat land. Crested wheatgrass in the Northern Great Plains makes a stand more readily than the native grasses and helps them to produce more beef. Year after year, this happened at the Moccasin station in the Judith Basin of Montana. It has an almost miraculous capacity for the monopoly of living space in the soil—as many as 315 miles of roots and rootlets have been measured on one plant.

There's no need to fear that this valiant fighter for soil protection and feed production may be sabotaged by our omnipresent enemy, weeds, where it is well adapted to soil and climatic conditions. T. K. Pavlychenko, of the University of Saskatchewan, Saskatoon,

has reported in the March 1942 issue of *Scientific Agriculture*, Ottawa, Canada, that in three seasons crested wheatgrass exterminated well-established stands of perennial sow thistle and toad flax. In four seasons it did away with a solid stand of Canada thistle, excepting a few puny plants where there was more alkali in the soil. Where crested wheat was seeded in the fall, following a close mowing and heavy harrowing of quackgrass, this pest was nearly exterminated in 4 seasons. Leafy spurge, poverty weed, field bindweed and hoary cress were so badly beaten by a 4-year fight with crested wheat that the hay was quite free of weeds, although they still had a root hold in the ground.

These fifth columnists of the field are well known as a menace to successful agriculture. They waste labor and power and cut the production of meat

needed to win this war. Let's give crested wheat and other grasses every possible help by harvesting their seed and planting them under the most favorable conditions. Let pasture and hay grasses exterminate and suppress weeds that are so costly to banish by cultivation. This is efficiency in times of labor, fuel, material, and equipment shortages.—A. T. Semple.

Soil Conservation wants short, factual accounts from the field of war-pointed farm activities: indications of the progress of the food-for-freedom program; how soil conservation districts are going about the job of boosting production while safeguarding their land; how farmers and technicians are merging their efforts to the common purpose. Boil down the items and send them in while they are timely.—The Editor.



Harvesting a 40-acre timothy field for seed, using grain binder.

THESE ARE THE SEEDS OF VICTORY

BY WELLINGTON BRINK, Editor

First, the seed. Then, the grass. Not just any seed. Not just any grass. Rather, seed of improved strains, of proved performance, of kinds speedily available in quantity. Seed of grasses and legumes fitted to do special jobs.

That is one of the important mandates of Agriculture's ambitious war program. That is the challenge flung by lend-lease demands for 20,000,000 pounds—600 carloads—of grass and legume seeds again this year. That is the assignment laid down by the Army, which must have vegetative camouflage . . . lawns for hospitals and cantonments . . . airport turf low in skid value, tough enough to survive the weight of heavy bombers. That is our obligation to weakened soils that cry for protective cover and a good needling of nitrogen. That is one essential wing of the production program, on which so largely depends the American output of milk and butter and eggs and meat.

Seed needs were anticipated in Capital and in States. Of late the public had become surprisingly "grass conscious." We were learning that grasses and legumes are as varied in uses and adaptations as grains and garden crops. A pasture mixture that serves well in the mid-West may not do at all in the Northeast. A clover that fattens hogs in Ohio might prove slippery footing for a flying fortress. A cover ideal on a golf course in all probability would fail signally to stabilize a highway. People are getting to distinguish between the vegetative fabrics on which mankind walks. They are noting ornamental aspects, heights and stamens, seeding and spreading proclivities, feed values and competitiveness. Happily, they are becoming aware of the individualities of scores and hundreds of grasses and legumes, and of particular strains of grasses and legumes.

Much of the ground, therefore, had already been prepared when war's seed requirements began to germinate. Set up promptly, for example, was a Department of Agriculture seed committee headed by "Bill"

Watkins as chairman. At least three-fourths of the State experiment stations had initiated breeding programs to discover the superior grasses and legumes for seeding meadows, western range lands, pastures, abandoned crop lands, lawns, recreational grounds, highway embankments and sod waterways. Forty-two States were studying 69 grass species, hundreds of strains. More recently Federal and State agencies went into huddles on the production and distribution of seed of improved strains of forage crops in Illinois, Missouri, Kansas, Oklahoma, Nebraska, Wisconsin, and Texas. Uniform grass nursery tests had been started in 36 States. Pennsylvania scientists were trying out special seeding methods.

All such developments bear constructively on the pressing needs for seeds in quality and in quantity. But it took the grass-minded Northeast, long accustomed to wearing of the green, to bring sharply to focus the thinking of seed-production groups.

Scene: Big Flats Nursery, in a broad valley of the upper Appalachian Plateau west of Elmira, N. Y.

Time: July 8 and 9.

Participants: More than half a hundred representatives of farmer cooperatives, army, seed improvement associations, seed companies, colleges, experiment stations, State and Federal agencies.

Modus operandi: Morning—inspections of observation plots and production plantings in the fields. Afternoon—discussions ramrodded by such experts as Grover Brown, O. S. Aamodt, Ray Culbertson, and Fred Grau. Evening—threshing of divergent views; a sparkling address by Joe Cox on The War and the Seed Situation.

Big Flats Nursery, operated by the Soil Conservation Service for American farmers generally and for the Northeast in particular, felt strongly the urgency, to use modern lingo, of a "directive." Long-time contributor to the improvement of American nursery stocks, and itching to play a vital role in the seed assignments of 1942 and 1943, Big Flats swung wide its gates, opened its fields to inventory and appraisal, asked agreement on a drive for seed production. Farm, science and industry—amazingly—did reach such accord, and drew up specific recommendations. (See p. 55.) In so doing, they set a pattern not only for the Northeast but for the rest of the country, as well. They established a precedent for similar gatherings in other locales.

Big Flats' specialty always has been cooperation. Here's the usual sequence:

From State experiment stations, from Aberystwyth, and from other foreign sources, come seeds in packets bearing Latin labels and numerous implied question marks. Adaptation? Vigor? Usefulness? Potentialities? Range? The seeds and the question marks are consigned to measured plots in "observational" plantings. That's the first step.

Second step is to increase such specimens as prove promising—these go into "production" plantings.

Seed from production plantings then goes to selected farmers for field trial and further increase.

Finally, mass distribution. Thus is completed a cycle which begins with scientific inquisitiveness and culminates in the hay press and the abattoir.

The morning of July 8 the neat, well-deployed ranks of the observational plantings were given a keen-eyed onceover. Rooted with assurance in gray silty loam—a product of glacial outwash—the plots proudly accepted this critical inspection.

Oregon bent, meadow foxtail, big bluestem, tall oatgrass, the interesting bromes—meadow, smooth, awnless, Washington; hairy chess; the deep-rooted crested wheatgrass, so increasingly popular in the Upper Great Plains and one of the earliest grasses in the New York area.

Yes, and here are both pasture and hay types of

IN ATTENDANCE

O. S. Aamodt.....	BPI, USDA.....	Washington, D. C.
Gilbert H. Ahlgren.....	New Jersey Agricultural Experiment Station.	New Brunswick, N. J.
S. S. Atwood.....	Pasture Research Laboratory.	Pennsylvania State College.
Richard Bradfield.....	Cornell University.....	Ithaca, N. Y.
Wellington Brink.....	SCS, USDA.....	Washington, D. C.
Grover F. Brown.....	Do.....	Upper Darby, Pa.
F. P. Bussell.....	Cornell University.....	Ithaca, N. Y.
Clarke W. Clemmer.....	Eastern States Farmers Exchange.	Springfield, Mass.
H. R. Cox.....	New Jersey Agricultural Experiment Station.	New Brunswick, N. J.
Joseph F. Cox.....	USDA.....	Washington, D. C.
R. E. Culbertson.....	SCS Nursery.....	Big Flats, N. Y.
J. A. DeFrance.....	Rhode Island State College.	Kingston, R. I.
J. F. Delahunt.....	Eastern States Milling Company.	Buffalo, N. Y.
J. B. R. Dickey.....	Extension Agronomist.....	State College, Pa.
Earl E. Dix.....	Philadelphia Seed Co.....	Philadelphia, Pa.
C. R. Enlow.....	SCS, USDA.....	Washington, D. C.
O. S. Fisher.....	Extension, USDA.....	Do.
C. S. Garrison.....	New Jersey Agricultural Experiment Station.	New Brunswick, N. J.
R. J. Garber.....	Pasture Research Laboratory.	State College, Pa.
H. G. Gibson.....	G. L. F. Mills.....	Arkport, N. Y.
Fred Grau.....	U. S. Army Engineers.....	Washington, D. C.
D. L. Hayes.....	Assistant County Agent Leader.	Ithaca, N. Y.
M. A. Hein.....	BPI, USDA.....	Washington, D. C.
Clarence I. Hendrickson.....	AAA, USDA.....	Do.
R. S. Henson.....	Eastern States Milling Co.	Buffalo, N. Y.
E. A. Hollowell.....	BPI, USDA.....	Washington, D. C.
M. M. Hoover.....	SCS, USDA.....	Do.
W. C. Huff.....	Extension Soil Conservationist.	Ithaca, N. Y.
Bruce P. Jones.....	New York Seed Improvement Cooperative Association.	Do.
John R. Kessinger.....	U. S. Engineers, War Department.	Syracuse Army Air Base.
L. O. Kurtz.....	G. L. F. Mills.....	Buffalo, N. Y.
John Lamb, Jr.....	SCS, USDA.....	Ithaca, N. Y.
Gaspar A. Loughridge.....		Big Flats, N. Y.
H. A. MacDonald.....	Cornell University.....	Ithaca, N. Y.
Lee H. Morrow.....	Pennsylvania Department of Highways.	Clearfield, Pa.
M. T. Munn.....	New York Experiment Station.	Geneva, N. Y.
R. B. Musgrave.....	Cornell University.....	Ithaca, N. Y.
W. M. Myers.....	Pasture Research Laboratory.	Pennsylvania State College.
R. S. Obier.....	Farm Security Administration.	Upper Darby, Pa.
J. S. Owens.....	University of Connecticut.	Storrs, Conn.
A. L. Patrick.....	SCS, USDA.....	Upper Darby, Pa.
C. E. Phillips.....	Delaware Agricultural Experiment Station.	Newark, Del.
Ford S. Prince.....	University of New Hampshire.	Durham, N. H.
George H. Serviss.....	Cornell University.....	Ithaca, N. Y.
C. W. Shaw.....	U. S. Engineers, War Department.	Syracuse Army Air Base.
V. G. Sprague.....	Pasture Research Laboratory.	Pennsylvania State College.
W. D. Swope.....	Cornell University.....	Ithaca, N. Y.
J. K. Thornton.....	Agronomy Department.....	Pennsylvania State College.
F. O. Underwood.....	G. L. F. Mills.....	Ithaca, N. Y.
E. Van Alstine.....	Cornell University.....	Ithaca, N. Y.
Geo. Wenner.....	G. L. F. Mills.....	Buffalo, N. Y.
Don J. Wickham.....	AAA, USDA.....	Ithaca, N. Y.
R. G. Wiggans.....	Cornell University.....	Do.
E. L. Worthen.....	Do.....	Do.



Orchard grass selection from domestic-grown seed sources. (Photographs used with this article by courtesy of Bureau of Plant Industry.)

the valiant redtop. Next, a woody, leguminous, perennial shrub of unusual promise at this time and one which does not require a rich soil—none other than false indigo, a wildlife friend useful for field borders and camouflage.

Next on parade comes *Astragalus chinensis*—a vigorous perennial legume, a good spreader, a bountiful producer of seed pods. Right next to it is a skeptic's pet, *Astragalus cicer*, pleading not guilty to the charge of alkaloid poisoning; it is not a selenium carrier, on the contrary claims merit as a producer of forage. Beach indigo follows, nudged closely by the talented crown vetch, noted for its underground root stalks and for its ability to handle steep banks; crown vetch is a legume palatable to livestock. Beach pea, nearby, has been found fine for tying down the sand of lake shores. *Lathyrus latifolius* is a perennial pea worth watching. Likewise, tuberous pea. Next in line is our old friend *Lespedeza bicolor*, a high-growing perennial. There's been quite a furore in recent years over birdsfoot trefoil, and here it is in several varieties, each of distinct possibilities and considerable achievement already to its credit. Several smiling clovers greet us now—red, Hungarian the cover specialist, and the wonder-working ladino.

We pass lingeringly down the ranks, scanning

SEED INCREASES RECOMMENDED BY THE BIG FLATS CONFERENCE

To meet war-emergency needs		To meet long-time agricultural needs
Military	Agricultural	
Creeping red fescue Victoria perennial rye Field fescue	Orchard (S-26) Brome (2683-1) Orchard (Brage) Milton timothy Tall fescue (2659) Weibull's Italian rye	Brome Orchard (Brage) Milton timothy Creeping red fescue Tall fescue Victoria perennial rye Weibull's Italian rye Westerwolt rye Primo Kentucky blue Roskilde birdsfoot trefoil

closely beardless wild-rye, redtop, switchgrass, valued as a mulch for vineyards and orchards; sheep fescue, important to the Northeast. A worthy representative of sea lyme grass is scanned carefully, for it has already shown itself an eager spreader and a doughty warrior on tough sites; it has been effective in stabilizing areas subject to salt spray. Milton timothy receives numerous approving nods for its lush growth and massive seed heads. Orchard grass—S-37 from Aberystwyth—offers itself as a capable dual type for both pasture and hay.

Reed canary makes its bid, too, bringing from Min-

Our seed reserves are now low, and with our own future and the peace of the world at stake, ample supplies of needed seed to provide against seasonal disaster and to take care of all production needs are of primary importance. In ordinary times, civilization moves along year after year on the bridge of the seed reserves of crops for food, for fiber, and for other human needs, stored from harvest time to planting time. During war time, this bridge of our seed supply must be widened and strengthened to insure that we, and not the enemies of civilization, prevail. No effort should be overlooked in providing needed seeds of all kinds, the ammunition for the United Nations' agricultural war program.—Joseph F. Cox.

nesota and other regions a merited reputation for prime performance on soggy and peaty spots. *Panicum obtusum* proves a bit of a puzzler, but turns out to be simply vine mesquite with a knack for controlling banks and waterways; it smuts badly and has seeded poorly at Big Flats, where it has been maintained the past two years. The usually reliable timothy looks good, and the Kentucky bluegrass fair. Weeping lovegrass is more cheerful than its name; Michigan has employed it for years in diversion ditches, it has performed satisfactorily in Florida, Arizona, and Texas, and is counted as one of the best dust-lickers of the Southern Great Plains.

This brief review by no means fully catalogs the inhabitants of the Big Flats observational plantings, but it presents a fair sampler.

At the end of the tour, A. L. Patrick, SCS regional conservator, expressed the thought that right here in the presence of the plants themselves was the ideal place for everyone concerned to discuss their problems and to chart a program calculated to prevent some of the mistakes of the First World War.

Said BPI's distinguished O. S. Aamodt, leading off post-inspection discussion:

With nitrogen supplies cut off, legumes have work to do. Particularly is this true in the South. Vetch and peas goals, for example, are up 250 percent . . . Instead of the normal 500,000 pounds of orchard grass seed, we must climb high—reach for a lusty 2,500,000 pounds, for the British are yelling for a round two millions . . . Take dwarf Essex rape—we didn't used to grow any, now the call is for three to four million pounds of seed.

Commercial nitrogen can be expected to increase cotton yields by 200 to 300 pounds per acre, Aamodt

observed. Legumes, on the other hand, will jump production by 400 to 600 pounds. In view of war's industrial requirements, therefore, the logical approach is seed rather than chemicals.

Someone tallied up obstacles in the way.

Feed requirements are one great hindrance to attainment of the seed goals. First cuttings of red clover and alfalfa ordinarily go for hay or silage, second cuttings are available for seed. A Wisconsin farmer, striving to boost output of cheese and butter, normally will wish to put the clover into the milk pail—it takes strong urging to get him to let it go for seed.

Then, there is the rival need for nitrogen, which causes crops to be plowed under for soil improvement.

Third, the steady spiraling of foreign demands not only for Britain but for China and Russia, as well. To produce seed, America must have seed with which to start. When Great Britain suddenly went into the market for orchard grass seed in a big way, the price skyrocketed from 14 cents per pound to 28 cents. Seeds of red clover and ryegrass suddenly became precious commodities. Encouraging is the fact that open-market bidding has now been supplanted by a relatively stable contract system. Even so—with reports that seed supplies are becoming unequal to carrying on regular cropping operations in Europe, and the possibility that one day the way will be open for replanting "scorched earth" everywhere—the probability is that seed demands will continue to mount not only during the war but afterwards, too.

Fourth difficulty results from the boosting of crop acreages. Best illustration, perhaps, is soybeans. Crops are stepped up, in many instances at cost of hayfields and pastures.

Fifth, price inequities. There's assured profit in the sale of such seeds as soybean, hemp and flax, for they are blessed with guaranteed price bases—but there's no floor on the seeds of grasses and legumes.

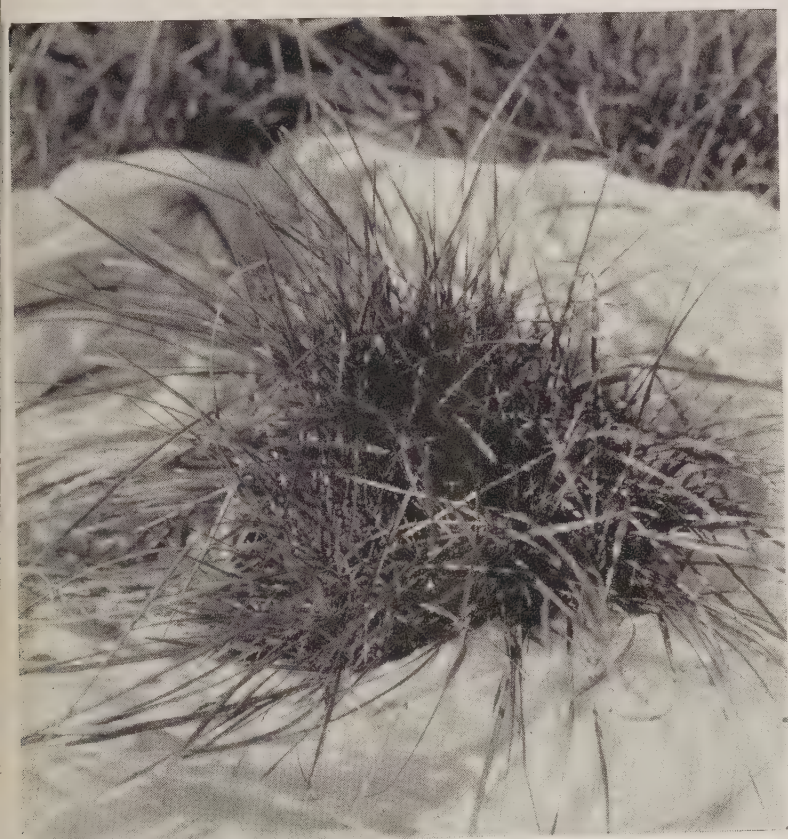
These are just a few of the kinks which indicate the desirability of home seed production and of a National seed policy, with a sound, intelligent educational program on the side.

At Big Flats it was felt that government and commercial interests should throw their support to the growing of perennial and biennial seed crops in preference to annuals, that recognition should be accorded to superior strains and varieties in the emphasis of which we are "25 to 30 years behind." Leading question: Are enough good stocks available?

Thus far, it would appear, we have done fairly well. But the pile-up of needs infers that a surplus, even, would be better than an insufficiency. For 1943 the



Broad-leaved strain of Kentucky bluegrass, developed by selection at Beltsville, Md.



A fine-leaved strain developed by selection at Beltsville, Md.

Department program calls for increases of 65 percent in alfalfa acreage, 29 percent in orchard grass, 64 percent in red clover, 28 percent in alsike clover, 24 percent in timothy. That's farm front, alone. In addition, there's the Army—posts, hospitals, cantonments, airfields, which will have to have every bit of 4,000,000 pounds of seed. The fact that numerous

Southern airfields can be sprigged with Bermuda keeps the order from zooming further.

The Army isn't fooling when it states its requirements. Fred Grau advanced certain principles essential to the development of turf for military purposes. The Army is rapidly shifting favor from concrete and asphalt runways, which are of critical materials, to grass turf that will stand up under heavy traffic and that will renew itself quickly. Turf construction may be longer—or shorter—but fields have been readied in as little as three weeks. Use, as well as materials, governs the choice of turf.

For erosion control, the Army wants (1) low-growing vegetation, (2) rough vegetation that blends into what is growing naturally in the vicinity, that requires no mowing or other maintenance, that responds to a light rate of seeding, say 15 to 25 pounds per acre.

For lawns, the Army is in the market for grasses that will do well, for example, on hospital grounds. The psychological effect of well-planted, well-kept grounds is fully recognized by Army and Navy doctors.

Specifications are sharp for military turf intended for intensive use. Grasses must be dense, tough, deep-rooted, good foragers for moisture and plant food. The Army thinks in terms of grass to be cut never lower than 2 inches or higher than 6 inches. The Army engineer and the golf greenkeeper have much in common these days, and the turf of well-handled athletic fields, subject to cleats and hard usage, comes close to meeting the airfield standard. Legumes—with the occasional exception of the woody-fibered lespedezas—are definitely out. For legumes are lush, easily bruised, shallow-rooted, of comparatively low density, high in skid factor. Many of the legumes, too, are of strong tones and produce brilliantly colored blossoms, making them overly conspicuous from the air. The Army would like seed of improved strains in larger quantities than it has been able to get them, and at reasonable prices. Under existing conditions, it is having to rely a lot on Kentucky bluegrass, Chewing's fescue, and Bermuda grass, which it establishes by light sprigging followed by seed. It is finding ryegrass useful for speeding the development of turf.

Legumes may be out of place on an airfield, conceded Dr. Richard Bradfield, opening up a heavy barrage of questions and comments. But, said he, legumes are even more important than grass to the agriculture of the Northeast. There has been entirely too much grass hay, he avers, in proportion to legume hay. The lively demand that has already been seen for ladino clover is but the beginning of the demand to come. Bradfield suggested that more attention be given to wilt-resistant strains of alfalfa.

Tidings from the Northwest were brought by M. A. Hein. Approximately the same seed harvest as last year is in prospect there. There has been an increase in the acreage of red fescue in Oregon, where 100 pounds of seed per acre will be good. Excessive rains have hampered the harvesting of seed.

Coming eastward, Hein noted the interference of rain again in Kansas and Nebraska where, however, there should be considerable increases in seed of the bromes and fescues.

The Virginia fields have been shocked up. Farmers there are harvesting all the orchard grass seed they possibly can.

Stanley Owens gives a Connecticut slant: There is need for at least a 50-percent increase of legume seedings in the Northeast; a shortage looms of ladino clover seed.

John Dickey: "Sow lime, phosphate and manure—and never mind about the seed."

Ford S. Prince: "We're going to have to go to potato growers and to others who are not in dairying, to get the needed production of ladino clover seed." Prince suggests that special care be given to the use of existing seed stocks, that red clover be given an annual top-dressing of potash.

Mr. Grau: Local production is one way to ease the transportation difficulty. Use the so-called marginal lands. Many thousands of acres plowed in the past, but not now in production or consigned to trees, could be brought back for seed production. Agriculture is entering an era of specialization. From standpoint of costs, yields and price, many farmers could improve their lot by going into seed production in a big way. There are farmers who have actually paid for their farms in one year from seed alone.

Clarence I. Hendrickson: The Triple-A probably could go so far as to make certain payments for seed production.

C. R. Enlow: In the past few years the production of certain seed crops has been encouraged in the Southeastern States. Spectacular progress has been made by the seed-patch idea for winter cover crops, bur and crimson clovers, blue lupine, the lespedezas. The growing of farmers' own seed—one or two acres of seeds locally adapted—has been pushed. Interesting and ingenious devices for harvesting have been worked out by farmers themselves.

Bruce P. Jones asked what means of control are available to assure farmers getting the seeds they are paying for. He wondered if seed mixtures containing weed seeds might not do more harm than good. He suggested that seed associations do what they can to promote the production of good seed and to keep prices at proper levels.

E. A. Hollowell, back from the North Central region told of bettered prospects for seed. Estimates are for 85 to 90 percent increase in red clover seed, 75 to 80 percent increase in sweetclover, and appreciably larger seed supplies of timothy, redtop and other popular grasses. In Ohio, soybeans have invaded the clover bailiwicks on a large scale. Missouri may have enough lespedeza; 75 percent of the soybean crop there has heretofore gone for hay—this year, in contrast, 60 percent is being grown for seed. He reported 300,000 pounds of Cumberland clover seed available in the western seed-producing area. The Midwest generally has suffered from an excess of moisture, farmers have been turning their hay to assist its cure, but poor quality hay and poor seed harvests are the rule. This underscores the emphasis on seed production.

Thus the notes were compared, thus the variant viewpoints met and mingled. Pros and cons whittled away at each other seeking solutions. Intent was to simplify the attack, to decide where to concentrate the effort.

It was well enough to prime the thinking of the conference by test, by observational nursery plantings. The clincher would come in a studied appraisal of increase—production—plantings, for these are the nearest thing to farm fields themselves. How do these grasses and legumes—newcomers or old-timers—perform when given a man size job? That's the challenge. We can tell better when the seed packet is superseded by bushels at the sowing.

So, with the issues clarified, a look at bigger-scale plantings was in order. The morning of July 9 the conference adjourned to the fields once more.

There it found Big Flats getting up to 600 pounds per acre from that promising orchard grass known as S-26. It was yielding three times as much seed when planted in 30-inch rows as when broadcast, and doing a tight, enthusiastic job of soil defense. The heads shatter easily, and a combine seems to harvest more completely than a binder.

Fylking Kentucky blue from Svalof, Sweden, showed a nice leafy stalk, has performed well through drought, has resisted disease, has done better from solid seedlings than from rows. It was clean, good grazing; conservative in the setting of seed, yielding perhaps not more than 75 pounds to the acre.

Smooth brome—the creeping type, 2683-1—was quite uniform in growth, a maker of 400 to 500 pounds of seed. Disease resistant, quick to recuperate from near-disaster.

Brage orchard grass, brought to Big Flats from Svalof, Sweden, sharpened interest. Tall growing, of the hay or silage type, Brage has demonstrated

vigor, leafiness, rapid establishment, a good aftermath, winter hardiness, and good seed production.

Sometimes known as cord grass, Viking creeping red fescue looked well here and has a reputation for excellence in lawn mixtures.

A miniature farm field nearby indicated a natural cooperativeness between birdsfoot trefoil and timothy when used in combination.

Crown vetch proved efficient for ground cover and bank stabilization. It propagates from stolons or a small amount of seed, weaves a marvelous mat. Disked heavily, crown vetch comes back like the valiant trooper it is. About its only drawback is the tendency of seed segments to break. Big Flats planned to mow, let the vetch dry and try to combine.

Milton timothy—a multiple strain obtained from McDonald College, Canada—was found early maturing, high yielding, of good aftermath, fairly resistant to rust.

Beach—Holland—grass was putting on a class-A performance. It shoots out long rhizomes; creeps, unlike its Western relative. It loves a wrestle with shifting sands. The Army wants 5,000,000 plants.

Alta meadow fescue came from Oregon, where it is increasingly popular as grazing for sheep and cattle. It's a good partner of clover, ryegrass, timothy and orchard grass. In 1940 Oregon harvested around 80,000 pounds of the seed; this year the take will run from 300,000 to 400,000 pounds. It will sometimes turn yellow in mid-summer if there is a nitrogen deficiency.

Roskilde birdsfoot trefoil, a distinct hay type, offered promise. It is one of the leafiest strains at Big Flats. It is not, however, a heavy seeder, and it is somewhat subject to leafhopper.

Canada wild rye's specialty is river-bank and gully control. It also makes a satisfactory cover crop. It has large seeds, which can be planted deeper than those of ryegrass. A true perennial.

The foregoing are but a few of the many grasses and legumes disporting in production panels. It is hardly equitable—though highly necessary—to omit comment on many other plantings of proved prowess or exceptional potentialities: doughty candidates such as Jaersk perennial ryegrass, Burnett, meadow foxtail, Reed canary grass, Victoria perennial ryegrass, Dollard red clover, Weibull's Italian ryegrass, Weibull's primo bluegrass.

With freshened knowledge of materials available, the meeting got down to a sifting of plant possibilities for war and after-war service. As M. M. Hoover pointed out, Big Flats is fairly representative of all regional Soil Conservation Service nurseries. Hoover urged seed production and seed distribution as the primary job. He pointed to the significance of the Kansas plan, in which SCS teams with crop improvement associations to allot seed to growers. There the State college recommends, and the association certifies.

The score or more of grasses and legumes which the conference at last unanimously approved for seed increases, fall naturally into three classifications according to separate and related functions: military, farm emergency, and long-time program. To my knowledge, this is the first intelligent and comprehensive attempt at such delineation. With appropriate variations to suit regional conditions, market fluctuations and altered needs, the recommendations might well serve as a guide not only for the Northeast but for the Nation, as well.

FOREST FIRE CONTROL IN A GEORGIA COUNTY

Landowners, civic organizations, service clubs, and public agencies in Greene County, have joined hands in a united effort for control of forest fires. This is particularly important in Greene County where the average farm uses \$105 worth of wood products annually; where more land is used for woodlands than for all other crops together; and where almost two out of every three acres burn over annually. If forest fires are stopped, this land will produce at least 30 percent more timber, on the same acreage, than in the past.

A county forest fire control board composed of farmers from different sections of the county will direct the program. This board recognizes that fire control is the responsibility of the people of the

county. They believe that the greatest contribution can be made by the people themselves, and that this means that all individuals (1) stop the practice of burning hedges, terraces and fields; (2) report fires to the community fire warden; (3) help to fight all fires that burn; and (4) make sincere efforts to interest their neighbors in fire control activities for the good of the whole community.

The volunteer forest fire control program has the active support of the Board of County Commissioners, the Board of Education, the Piedmont Soil Conservation District, the Soil Conservation Service, the Extension Service, the County Farm Bureau, the Farm Secur-

ity Administration, the Agricultural Adjustment Agency, service clubs, civic associations, and other public-spirited groups. Considerable thought has been given to the organization that will carry out this program, and local people believe the fires which have ravished the county annually can and will be kept under control by this organization of the people to stop destruction of their forests.

The Soil Conservation Service is vitally interested in this program because the control of fire is important in erosion control and also because the Service is responsible for the protection and management of approximately 28,000 acres of Title III lands in Greene County.—Edward G. Grest.

CONSERVATION FOR TODAY AND TOMORROW

BY H. H. BENNETT¹

(Concluded from August issue)

After a visit to the North Elm Creek area, I came away more encouraged—more optimistic about the ability and the eagerness of American farm people to establish permanent farming systems. No such permanency is possible, of course, if the land is allowed to waste away.

This same general spirit prevails in many other parts of the Nation, especially throughout the rolling lands of the cotton and tobacco sections and the hilly portions of the Corn Belt, the Wheat Belt, and even the potato lands of Maine. The 1930's may well go down in North American history as the decade of conservation. It was during this period that we in the United States first started to study and attack the erosion problem on a nation-wide scale. And it was on the 12th of May, 1934, that the first great dust storm rolled 2,000 miles across America from the "Dust Bowl" country just east of the Rocky Mountains to blot out the sun over the nation's capital and to blow grit between the teeth of New York City folks.

During the 1930's people in all parts of the country and all walks of life began to think about the soil and its preservation more seriously than ever before. Farmers and agricultural workers combined their efforts to transform the abstract principle of conservation into a living reality on the land. During the past four years the whole movement has been given tremendous impetus by the passage of soil conservation districts laws in 42 States, including every one of the Southern States.

There is every reason, with the start that has been made, to look forward to a vast spreading out of work like that done along North Elm Creek, Texas, over the other millions of acres throughout the country needing protection from erosion. There is no reason why this work cannot be spread to the many millions of acres throughout all the Americas.

There is no reason why the tremendous resources of the Americas should not be conserved for the use of future generations of Americans, and there *is every reason* why they should be.

The things that happened centuries ago in the Near East must never happen in the Americas. We Americans, all of us, no matter in what latitude we live or what language we speak, believe in America. We want America always to be a place where people may live in security and freedom. These are the things the democracies are fighting for.

But all of the fighting, all the bloodshed and horror, all the money and lives spent, will have been in vain if we do not preserve our natural resources of soil and water. Good soil is the backbone of a nation. A virile agriculture, which must be founded on good land, is the foundation of prosperity and security because that is the only basis for a permanent agriculture. And just as we cannot have a virile agriculture without good land, neither can we have good land unless we use it wisely and take good care of it.

There are tremendous agricultural possibilities in the Americas. We have damaged some of our land, but we have left a tremendous reservoir of productive soil which will sustain us through many centuries if we use it in accordance with its capabilities.

Land Capabilities

We must know what our land is capable of producing—what sort of crops it is best suited to grow and what sort of care we have to give it to keep it productive. We must know the land intimately before we can work out a safe and efficient program for cultivating it. This means we must study it carefully through the medium of physical as well as economic surveys.

In order to ascertain the needs and adaptabilities of the various kinds of land and land conditions, a new system of classification has been devised to serve as the basis for developing blueprints of land conservation. This system is known as the land-use capability classification. Degree of slope, kind of soil, severity of erosion, stoniness, wetness, organic matter content, acidity, and other readily determinable physical and chemical characteristics enter into the calculations and determinations involved with the system. Many millions of acres in the United States already have been mapped and their land-use capabilities determined and put into practical use.

There are eight land classification groups in this system. Classes I, II, and III represent the better grades of cropland, in use and potential. Class IV includes land that should be plowed only occasionally; while Classes V, VI, and VII should never be plowed for any crops except possibly as an aid to establishing a permanent cover of grass or trees. Class VIII land is not suitable for productive vegetation and is made up of such areas, for example, as rough stony land, cliffs, and mine dumps.

Information of this kind is essential if we are to do our work on the soil intelligently. I can think of few things that would hold more possibilities of

good for the Americas than a careful survey by all the nations of their lands, working together according to this standardized system of land classification.

Then hemisphere planning would really be possible—then we could accomplish such ordered production of farm and other crops as we have not previously thought of.

America is rich in possibilities. We have many types of land, every kind of climate: the temperate zones and the torrid zones with its tropic and subtropic belts. Agriculturally, all these regions have their possibilities.

Then we have mountains, high plains, valley lands, and coastal lands. We have, in other words, the soil, topography, climate, and rainfall to produce practically every important crop known to mankind.

We have in the Americas also a surprising area of land that to date has never known the plow—land rich in possibilities, that for economic or other reasons is yet to be developed. Such a survey as I have proposed would show how much of this land we have, where it is, and what we could and should do with it.

Abundant Opportunity of the Southern Littoral

We have a fair amount of idle undeveloped land in the United States, and there is a great deal more in certain parts of Central America and South America. There are large unused areas in some countries. The coastal zone, known as the Littoral, in many cases offers splendid opportunities for agricultural development, as do some of the great valleys that stretch far inland.

Being generally low, the Littoral is often humid, although this is not everywhere true. A narrow strip down the coast of Ecuador, Peru, and the northern part of Chile has low rainfall, as does a part of the lower Argentine coast.

However, a good portion of the coast of Latin America has an annual rainfall of 40 inches and up, and in many places the coastal rainfall reaches 60 and 80 or more inches a year. Such areas are in some respects similar to the Amazon basin.

Often these lands, which are in great measure relatively undeveloped agriculturally, have excellent soil. Many things, however, are needed: extensive clearing operations, sometimes considerable drainage, and of course carefully worked-out farming plans, based on painstaking surveys, that will show the land capabilities.

A great deal of the Littoral in the tropic and subtropic belts under wise land use policies and with farming methods designed to conserve the soil resources—and water resources, too, where water sup-

ply is a problem—can become highly productive agricultural territory. I have no doubt that the same things we have found true in our work in the United States will be true elsewhere: Conservation farming methods, such as contour cultivation, or terracing where necessary, and other soil-maintenance and soil-protection measures will not only conserve these valuable resources but will increase yields as well.

Much of the Littoral, particularly in the warmer regions, thus developed and wisely cultivated, can produce many crops for which there is a tremendous market throughout America and, particularly after the war, throughout the world.

These crops include cacao, coffee, bananas, balsa wood, kapok, cinchona bark for quinine (at somewhat higher elevation), tapioca, rotenone-bearing plants, spices, gums, and many others, including the vegetable oils which are so greatly needed today for military purposes. In the coastal zones of high rainfall, rubber—a key commodity in the world now—can be grown in localities of good, well-drained soil.

It will take a lot of work to develop these agricultural potentialities: Land will have to be cleared and in many places it will have to be drained. In some spots, sanitation measures will have to be effectively established, as was done in Panama, to make the country healthful. And the soil resources will have to be protected by wise land-use and land-management policies and comprehensive conservation methods for protecting and maintaining the soil and developing bigger crop yields.

To do all this work only in the undeveloped coastal regions of the Americas would be a tremendous undertaking. To do all that needs to be done throughout all the lands of America would be a gigantic job. But it all would be eminently worth doing, and it must be done. It must be done because this land of ours is tremendously important—to all the world today and in the years to come, and to our own descendants, our own flesh and blood, the grandchildren and great grandchildren of you and of me and of all of us.

Soil and water are for people—they are for people to use, not to destroy—to use and live from and maintain, and pass on to the generations that follow.

There is a very real and close relationship between the conservation of our soil resources here in America and the present emergency, but there is a relationship that is closer, if anything, between conservation and the years to come after the war is over—the years and the centuries and the ages. The man who has an acre of cropland, and cultivates it wisely and profitably and cares for it, so that others

may do the same when he is gone, earns an immortality far better-founded and more lasting than some who walk through the murky pages of history.

We must *save* our land—we must save every acre of it that we can, from Hudson's Bay to Cape Horn. We must save it so it will produce for the United Nations today, for the world tomorrow, and to provide a better world and a better life for generations of the future.

This means simple practices now—the conservation measures that give us bigger yields, per acre and per hectare, of the crops that are needed to sustain democracy and maintain the land in decent condition until the abnormal demands of war are satisfied and done.

It means comprehensive and thorough conservation throughout the Americas *after* the war: farming the land according to the crops or other uses for which it is best suited; terracing land that cannot be safely cultivated otherwise; contour cultivation and strip-cropping on lesser slopes; reforestation of woodland that should never have been cleared; returning to grass the grasslands that should never have been plowed; the control of floods at their

source, and prevention of sedimentation which fills up and ruins reservoirs and streams and ditches; conservation of wildlife, to maintain the ecological balance of nature; conservation of natural water resources; bringing into cultivation good idle lands that never have been utilized, in order to offset the land that must be taken out of cultivation; drainage, or irrigation in the regions where they are necessary; and *always* the maintenance of the soil itself—putting back into it the richness we take from it—by liming, manuring, fertilizing, and the use of good rotations.

Fortunately, the simple practices which we need for today's job provide an excellent foundation for the bigger job of tomorrow—and both are of the utmost importance. Conservation—true conservation, which means using the land today and at the same time preserving it for the use of others tomorrow—is a philosophy of action to which we Americans can well devote our lives. It is the *only* course by which we may live in security and freedom today, and assure our children and grandchildren of a heritage of security and freedom for tomorrow and tomorrow.

*Narration of new sound film of
Department of Agriculture.
(Subject matter of picture sequence indicated in parentheses)*

This is the Corn Belt.

A quarter of a million square miles of fertile land, extending from Central Ohio west to central Nebraska, and from southern Minnesota south to central Missouri.

The biggest piece of fine farmland in the world with a good agricultural climate . . . a land of corn and hogs and a hundred other crops to feed the world.

That's why the United Nations look to the Corn Belt today for a good part of all the food they need to win the war. A hundred crops to beat the Axis.

That's going to put a strain on our land, but we can do it . . . we've got to do it.

(Cattle and Hogs)

We did the same job the last war . . . We used mass production.

WARTIME FARMING IN THE CORN BELT



We grew corn, and wheat, and other crops, on every acre we had under the plow. And then we broke out *new* land with fine straight furrows—we thought that was the right way to farm in those days. We *had* to break out new land—or we *thought* we did—to grow the food that Uncle Sam had to have.

And after the war we kept right on . . . farming was getting to be big business and we went in for expansion. We did a good job of it and we were proud of our farms—proud of our production!

(Clouds)

Of course, when it rained . . . that was another story.

Naturally, a lot of topsoil washed away. The furrows ran straight and true up and down hill all right . . . but the topsoil ran only one way. Many a good field was cut by gullies, and sheet erosion ruined a lot more. We began to notice we had to work harder—use more fertilizer—to get a crop.

(Near End of Muddy Stream)

Then we began to realize that maybe we hadn't been doing such a good job of farming after all . . . We hadn't been taking good care of our land.

(Silt)

We found that topsoil, washed down hill and dropped as silt, won't grow corn.

(Corn)

Poor land means poor crops—and poor farmers, too. And a lot of us were getting poorer pretty fast, what with low prices and sick land. In the last ten or fifteen years quite a number have moved on, trying to find new places and good soil. You can't make a living out of gullies.

(Tractor)

Today, we're doing things differently.

We're all working together—to produce the right amounts of the right crops—on time. We're making our farm program work. We're using conservation farming methods . . . taking better care of our soil . . . That's the only way we'll meet our food production goals, the *only* way we can raise the food the United Nations need.

(Contour)

Take terracing and contour cultivation, for example: They stop erosion, but they do more than that. By holding the topsoil, fertilizer, and water on the fields, we get bigger yields per acre . . . bigger yields per acre *now*, when we need them most.

(Pasture Furrows)

On pasture land, furrows hold the water and make better grazing.

(Dam Construction)

Earthen dams are easy to build, and useful: they hold back water,

they make stock water pools, and store water for irrigation—if it's needed.

(Cows on Pasture)

And grass . . . We're growing more grass all the time . . . because it's a *crop* as well as a conservation measure . . . and good grass pasture is a good, inexpensive way to feed hogs.

(Hogs on Farms)

A lot of us are planting cover crops between the rows after the corn's been cut. Then we plow it under. It's a soil conditioner. That's *one* way to build up run-down land, and keep good land good. Simple and easy . . . and good conservation farming.

(Manure Wagon)

That's the sort of thing conservation farming is, after all: a big thing that helps us do big things; but some of the best practices are as simple and easy as A B C . . . like putting manure and fertilizer and lime on the fields.

These simple practices are important to America and the United Nations, especially now. We've found we can get more corn per acre, more soybeans, and more of just about everything we grow, using these simple conservation practices.

This means that if we use these methods generally, we'll surely meet our food-for-freedom goals!

Food for Freedom! That's a good slogan—a battle cry for the farmers of America.

And it makes sense, too. If we want to win this war, we've got to be strong . . . tough . . . and husky.

(Corn in Wagon)

So we've got to produce food, and a lot of it's got to come from the Corn Belt. We've got to grow more corn, we've got to grow more soybeans. We need soybeans for all kinds of food products: for



Food for freedom, from the Corn Belt's massive pantry.

salad and cooking oils—more tomatoes, more beans, more onions, more of all kinds of vegetables and fruits.

We've got to produce more milk—and more butter, too . . .

And more dried milk, to ship overseas—and more cheese—an important concentrated food.

More eggs, too . . . they dry 'em now to ship across the ocean, but they're still eggs and taste mighty good to a hungry man.

(Cattle)

We need more meat . . . more beef and more pork . . . for soldiers, sailors, and civilians . . . something that will stick to their ribs and keep 'em strong and husky.

Food is an important part of the material of war, and since the only way we can produce the added food we need is through conservation farming methods, that's what a lot of us are doing . . . because we've got to "keep 'em growing."

We've got to keep 'em rolling, by the trainload and by the shipload. We've got to send food *all over the world*. Food for the United Nations, Food for Freedom!

(Soldier Eating)

Here are some of the boys who are standing guard and fighting for us here and on the other side of the world. They look husky—and it's our job to help keep 'em

that way by growing the food they need.

We've got to keep our bombers flying, too . . . That takes men . . . and men need food!

. . . Those strips curving around the hillsides are a symbol of the new conservation farming that is helping the farmers of America produce!

While men in Flying Fortresses are doing their job, farmers are doing theirs. All over America more and more farmers are using conservation methods . . . to produce the added food we need!

To keep 'em flying and fighting . . .

Food for Freedom!

TEACHING SOIL CONSERVATION IN THE ELEMENTARY SCHOOLS

BY B. W. McGINNIS¹

Within a year, Elbert County, Colo., has become outstanding for the good work its public schools are doing in teaching soil and moisture conservation.

In August 1941 the Elbert County Agricultural Planning Committee requested the assistance of Federal and State agencies in arranging for a conservation education program for the public schools of the county. In compliance with the committee's request, representatives of the Soil Conservation Service and the Colorado State College met with a local committee consisting of the county superintendent, county agent, instructor in vocational agriculture and a group of rural school teachers to formulate plans for the introduction of soil conservation studies into the grade schools of the county. The meeting was held at Simla, Colo., on August 19, 1941.

Before school started in September, the committee held two other meetings at Simla and agreed upon an outline for conservation courses of study in the seventh and eighth grades.

Because of a lack of textbooks for the teaching of soil and water conservation, the Soil Conservation Service was requested to furnish textual and visual

material. A supply of bulletins, pamphlets, circulars, and illustrated charts was sent to each of the 67 grade schools in the county.

At the time of the first meeting, it was anticipated that some of the teachers might not have had an opportunity to become familiar with the subject of soil conservation. In order to meet this situation and to help all teachers to have a better understanding of the subject, members of the local soil conservation district staff, and the county agent, met with the teachers at the County Teachers' Convention and explained the soil conservation program.

According to a report from E. R. Graves, district conservationist at Simla, it is estimated that 75 percent of the 67 grade schools in the county have included soil conservation in their courses of study. Some of the smaller schools do not have the seventh and eighth grades and some of the teachers have not yet had an opportunity to become sufficiently acquainted with conservation work to undertake teaching the course this year.

Five of the schools in the county organized tours of the area to give the pupils an opportunity to study the effects of erosion and observe methods for its control. On these tours the

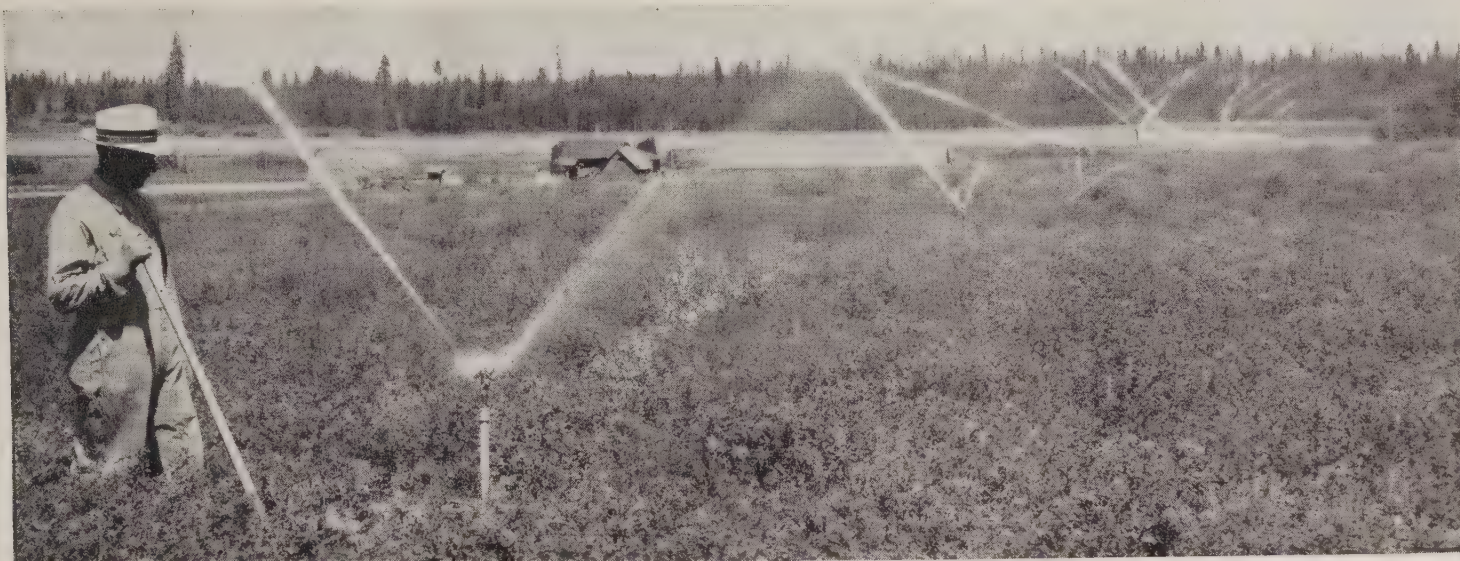
children were accompanied by representatives of the Soil Conservation Service who explained the different types of erosion and the various methods for preventing it.

Early in 1942, at a joint meeting of the boards of supervisors of the four soil conservation districts in the county it was agreed that the districts would sponsor an essay contest in order to create more interest in the conservation courses. Prizes were offered for the best essays and approximately 70 essays were received from 20 schools.

The writers of the 12 best essays in the county were taken to Denver on May 30 to participate in a 15-minute radio broadcast. Arrangements for the broadcast were made by the county agent.

The people of Elbert County feel that they have a problem in soil erosion and land use. They realize that eventually their children, who are now in the schools, will become the owners and operators of the land in the county. The school authorities and educators are alive to the fact that land constitutes the basis for the taxes that support the schools. They have proved that the teaching of soil conservation can be introduced into the schools of any community if the citizens want it

¹ Head, educational relations, Regional Information Division, SCS, Amarillo, Tex.



Ezra Eickmeyer, near Deer Park, Washington, profits greatly from water at the right time in the right quantity. Watch that alfalfa grow!

WHAT WATER DOES FOR PRODUCTION

BY J. H. CHRIST¹

Rainfall up to 100 inches a year—and irrigation? In some areas, yes. Some of the most valuable of the water facilities are to be found in the very heart of the high rainfall belt west of the Cascade Mountains. These facilities are helping 850 farmers and ranchers in Idaho, Oregon, and Washington to make a better living and to produce more dairy, vegetable, meat, and other food-for-freedom crops. I admit I was skeptical as to whether this “man-made rain” met a practical need along the Pacific Slope—until Regional Engineer Karl Kohler took me on a tour of a few of the 180 group and individual projects in our Pacific Northwest Region.

The first farmer we visited, in Pierce County, Wash., had struck good natural gas while developing his water facilities system. To his neighbors and the public, Lloyd Canfield's well, drilled to supply his sprinkler system for irrigating his dairy pasture and hayland, has been notable because of the gas. Not only does it provide lights and cooking fuel, but it runs the pump that pumps the water that brings up the gas that pumps the water—a perpetual motion proposition.

To Canfield the gas is a convenient curiosity—of even more practical interest to Mrs. Canfield—whereas the 161,000 gallons of water he can spray over his 34 acres of pasture and crops during a hot, dry, 14-hour midsummer day means money in the milk pail.

“All they can see,” he complained of the hundreds

of visitors to his place near Sumner, “is the gas part of it. They don't notice the irrigation so much, and that is the important thing to me.”

He estimates that the benefits tallied up to between \$1,200 and \$1,300 the first summer, when the sprinkler plant was in operation only a part of the season. That was on the basis of \$500 or \$600 lost the year before in seed, labor, and the use of two pieces of land he seeded unsuccessfully twice; \$500 or \$600 he made with the sprinklers by having twice as much hay as he had in past years; plus nearly \$250 saved in fuel for the house, milkhouse, and pump engine. The whole system, including special gas-separating equipment, cost him only about \$2,000.

“I wouldn't take twice that for it,” he told us. “I'll make something now. Before, I didn't! I don't suppose we would have got more than two-thirds as much milk as we did, without the water and pasture, and it would have cost more for feed, too.”

The yield from a quarter of an acre of mangels for cow feed leaped from 4 tons to 7; and, although they cut their garden in half under irrigation, the Canfields grew so much truck they could not even give it all away—that, of course, was before wartime canning got into full swing.

Canfield's experience is representative of the problem and the remedy in this moist but erratic climatic area—rain all the time through the fall, winter, and spring, virtually no rain from June to August, with pastures dried up when they are needed most. It is the same farther south in Oregon, where for years State College people have been recommending supple-

¹ Regional conservator, Pacific Northwest Region, Soil Conservation Service, Spokane, Wash.

mental irrigation in the beautiful, fertile Willamette Valley. Helped along further by water facilities, summer irrigation has become popular enough in this territory of specialty food, feed, and seed crops now so essential to the Victory effort that the recent relaxation on priorities for sprinkler equipment brought cheers from that area.

We stopped at Clarence Olson's place in Yamhill County, Oreg. He expects his sprinkler system to increase his income at least \$7 an acre a year during the 12 years the plant is paying for itself, and \$15 thereafter. He can put the water on 32 of his 47 acres. Although Olson was milking only about a dozen cows, he had similar experiences to report, of more pasture from fewer acres, bigger mangels, and better garden and clover, alfalfa and grain crops.

"No one had to convince me," he said without apology. "If you have the water where you can get hold of it, irrigation is the thing."

So it was all along the way down the coast—stories of success with the water and the balanced farm plans that go with it. Otto Reise, for example, figured \$500 extra profit from his daffodil and tulip bulbs the first year he had a water facility sprinkler system going—and that was before the European war really put the Pacific coast's "little Holland" bulb raisers into the money. Even \$500 a year added profit on a \$2,000 sprinkler investment did not seem too bad a showing—on only 16 acres! Reise lives in a 40-inch rainfall area near Puyallup, Wash., but formerly the dry autumns cut down both the growth and rotting of his wheat-vetch cover crop and delayed his bulb planting. The irrigation water now reduces his green manure and allows him to plant early.

"We also get a greater tonnage of bulbs, he told us, "by getting a higher percentage of No. 1 bulbs—for that's the way the tonnage works."

The Thurston brothers, dairy farmers near Yelm, Wash., reported better than a 30-percent increase in milk from 33 cows less than 2 month after starting to irrigate their pastures with a water facilities sprinkler. They already had ditch irrigation, but their gravelly soil caused water loss and leaching and poor fertilizer results.

"We were completely out of grass when we started this," Tom Thurston recalled. "I figured out that it won't take 25 percent as much water to irrigate the land and produce a crop on all of it as it did on one-half or two-thirds of it before."

The Thurstons have worked out a unique pasture rotation system. Their pasture is divided into 32 plots of little more than half an acre each by single-strand electric fence that Tom said cost only \$30 for the whole 20 acres. The herd is run on one plot for half a day and then moved to another, while the

droppings are spread on the grazed plot and the water put on it. That way, each piece is grazed but half a day every 16 days, and the cows have plenty of grass all the time.

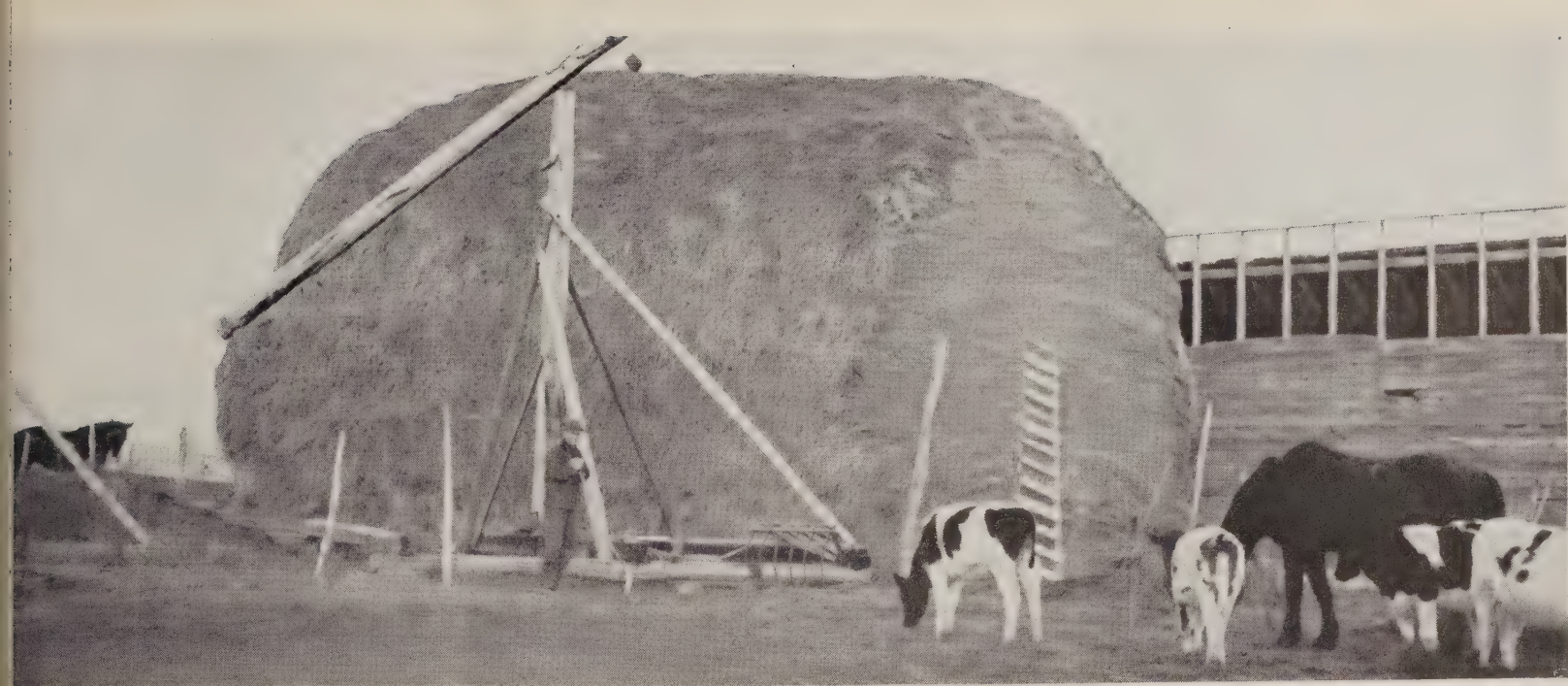
Jumping across eastern Oregon where water facilities are completed, or on the way to completion, for the benefit of 80 farm families, we found ourselves in southern Idaho. Major irrigation projects, large and small, have made this broad, semiarid territory one of the most productive in the West, especially for war-time feed, bean, potato, sugar beet, vegetable and other vital crops. Between the watered valleys are many smaller, equally fertile spots that have needed only a little water development or improvement for the salvation of the farmers on those lands. Soon, in these areas, 601 farm families will benefit from the 50 water projects, affecting 64,332 southern Idaho acres, that have been put into operation or are nearing completion. The cost is something like \$5.50 an acre for the land made more productive and dependable.

In Cassia County, Idaho, group facilities mean new life in one way or another for 24,000 acres of farm and ranch land, and new hope for no fewer than 225 farm families. We talked with officers of the Marion Pipe Line Co. about the 7½ miles of cast iron pipe (bought before priority days) that the men of this Mormon community just west and north of Oakley put in themselves—replacing an old, worn-out wood-stave system—to supply water for the 4,000 to 5,000 head of livestock belonging to the fourscore farmers. I had been fortunate enough to visit the so-called Goose Creek project before when they were digging the trench—contributing at the outset 7 days' labor for each of the company's 172 shares and then doing the rest of the work, down to difficult pipe coupling, at a reasonable wage rate to pare their costs further. There is also a 50,000-gallon reinforced concrete storage and desilting tank, built on contract.

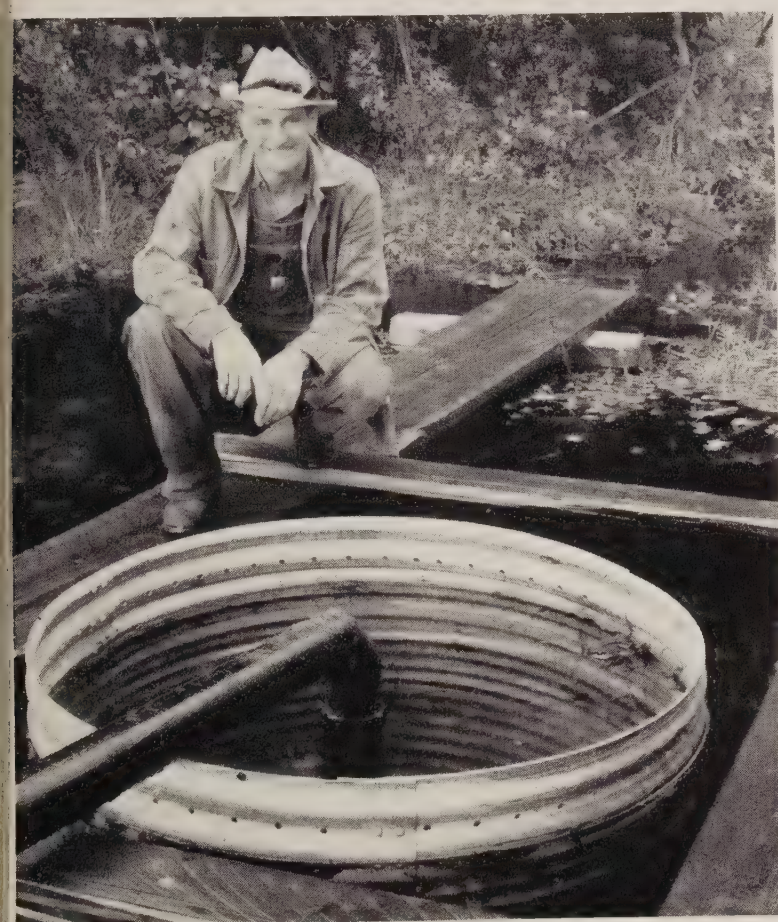
The pipe line makes it unnecessary for them to sacrifice their irrigation water from the Oakley Canal Co. for livestock use on the ranges surrounding the 4,000 to 5,000 acres of valley land they irrigate. And, as Director Eugene Pickett remarked, "It is my honest opinion that this new pipe line increases the value of the irrigated land not less than \$20 an acre."

Fifteen ranchers over on Sublett Creek in the Raft River Valley similarly are proud of their rebuilt, 56,000-cubic yard earth fill Sublett Dam that now assures them enough storage for all-season irrigation.² They have drilled wells, also, over the 1,400 affected acres, so that they do not have to draw on their winter

² See SOIL CONSERVATION, January 1940, p. 178.



Big haystacks and "Mormon derricks" are not unusual scenes in southeastern Idaho, but Gideon Condie's winter feed supply jumped to extraordinary proportions because adequate water facilities enabled him to store some of his excess early season irrigation water for later use.



Leo Williams smiles because of extra feed for dairy herd and beef cattle. His sprinkler system figured in the \$32,500 cash sale he made recently.

storage for stockwater. Unfortunately, the Oakley farmers would have had to drill so far down for water that the cost would have been prohibitive—hence their pipe line.

"Sometimes it would take nearly half the water in the reservoir to bring stockwater down this far," President William S. Adams of the Sublett Irrigation Co. told us. "That was when the weather was so

cold the water froze in the ditch along the way. By shutting the reservoir down dry as we do for the winter now, along with the wells, it gives us enough water to irrigate our original crop lands properly and quite a bit more."

Regarding his "individual" development, Gideon Condie remarked—when we caught him forking hay to the cows from the mammoth stack by the barn on his 160-acre place near Preston—"I had all the water I wanted, and carried over water that would have irrigated five acres of beets once more. In fact, there is a possibility it can service another farm if it is worked right. I have a bigger haystack, had more oats and peas, and raised a quarter of an acre of beans that I wouldn't have had at all—beans must have late water, you know."

Condie's problem had been that of having more water than he knew what to do with coming down his ditch early in the season, causing erosion and other worries, but not enough later on. An inexpensive 250-foot earth dam, 11 feet high, across the drainage from a quarter-section above his place solved his problem by giving him storage facilities.

Up on Mink Creek northwest of Preston, Adam Keller talked of his spring development and concrete stockwater trough as he might of a favorite nephew. He was of the opinion that if it had been developed 20 years earlier, it would have saved him much money—around \$800 alone for the cost of an inadequate spring he developed himself. He had 10 Victory-producing dairy cows among his 40 head of stock.

"My farm is worth a whole lot more than it was before," was Keller's conclusion regarding his spring and erosion-control farm plan.



W. D. Riddle surrounded by sunflowers. Irrigation helped fill his new silo, boost his butterfat production.

There was not time to visit with any of the two-score north Idaho farmers benefiting from water developments in that area, although Area Conservationist Leo L. Anderson, of Moscow, joined us and told us much the same story we had heard so consistently around the loop. We did take a look at the George Turner set-up near Grangeville, and marked him down as a model food-for-freedom producer.

With his low earth dam, built as a water project, he can store water from a large spring near the farmstead. He now gets two good crops a season from an 8-acre alfalfa field, and cuts additional hay from the irrigated area and from his conservation rotations for the 18 Shorthorns with which he is starting his beef herd.

Back at the Spokane territory in eastern Washington, Area Conservationist G. B. Swier took us on a quick local swing that made it clear enough we need not have traveled so far just to talk with enthusiastic farmers and ranchers for whom a bit of water and practical farm planning had turned near-marginal

farming into highly successful operations. The half-dozen men whom we visited left no doubt as to the advantages enjoyed by the 40 farmers in this area from their mostly smaller, individual water facilities.

It was Ezra Eickmeyer, 10 miles northwest of Spokane, who started the sprinkler irrigation movement in this section. It boosted his seed potato, alfalfa, and other crop yields so high that he hesitated to reveal the extent of his added profits—he harvested something like 150 100-pound sacks of seed potatoes on $4\frac{1}{2}$ acres the first year he had the water. Before, he could not farm enough of his land to make it a paying unit. He also grows war-demand vegetable crops on part of his 35 watered acres.

W. D. Riddle, near Deer Park, was one of those who took up Eickmeyer's sprinkler idea. Now he can fill a silo he built for his dairy herd after he put in the water facility. Corn and sunflowers are his silage crops. "Last winter," he said, "I had enough silage to carry me through until the first of May. Then the pasture was good. Before we got the sprinkler, I was buying a lot of my feed. The Northwestern Washington Dairy Herd Improvement Association records show that my herd butterfat average jumped from 288.6 pounds in 1938, and 305.7 pounds in 1939, to 357.7 pounds in 1940—with 14 cows in 1938, 17 the next year, and 18 in 1940. I figure the milk year to the first of March; and this year it will be 375 pounds. I expect a 400-pound average next year."

If Leo Williams could have had such sprinkler irrigation water on his Smith Center, Kans., corn and wheat farm during the drought years, he probably would not have thought of coming to eastern Washington and building up a dairy and beef cattle business on the old 1,176-acre Alex Gussagaits ranch on Diamond Lake near Newport. The sprinkler picks the water up from his own spring-fed creek; the creek, incidentally, was useful in other ways—it cooled his milk and ran a water-wheel to generate electricity for lights and milking machines before he switched to REA power.

Williams estimated, "very conservatively," that with the water he was able to increase his alfalfa yield by 60 or 70 tons. Without it, he said, he had been short on feed for his 80 head of beef on the range so that he had to sell down one year to 50 head, including his 30 milkers. Possibly, though, I should not have included Mr. Williams, for he has just sold his ranch for \$32,500 cash. His sprinkler irrigation system was one of the "considerations" mentioned in Spokane newspaper's prominent story on this property transaction by an erstwhile "dust-bowler."



BOOK REVIEWS AND ABSTRACTS

by Phoebe O'Neill Faris

FOCUS ON AFRICA. By Richard Upjohn Light. Photographs by Mary Light. American Geographical Society Special Publication No. 25. New York, 1941.

There probably isn't an American who has not said at one time or another, "I want to go to Africa before I die." Few of us have gone, or will go, and so I am pointing out this fine book as "next best thing." Dr. Light and his wife, Mary, made their remarkable flight over Africa, from stem to stern, camera clicking, only a short time before deadly and bitter warfare began its ghastly parade back and forth across the Northern wastes of the continent. Having read their book, with its hundreds of magnificent photographs, one cannot but hope the war will confine itself to the wastes. What a pity, should the brave new countries of the South and East have to suffer agonies conceived in old and bitter lands where brutality has attained the "refinements" of progressive civilization!

There is a little of everything, and much of many things, about Africa, in this book; but the basic "focus" is upon the problem of the soil of the great continent and what is happening to it and will happen to it in centuries to come as the new countries work out their racial and bilingual problems, governmental and economic patterns, and above all, their agricultural future. In a way they are fortunate: They can look at their watersheds, their valleys and mountains from above, as birds in flight, by way of aerial photography. If, a century ago, our own agricultural forefathers had been able to ascend toward cloudland and take a look at, or photographs of, say Virginia's own river, the James, and its tributaries, at least they would have known a watershed, and that brooks and creeks and rivers have a way of washing unprotected soils into oceans.

In other ways, the tropical continent is not so fortunate; in fact, as Dr. Light states in his introduction—written apparently after war had started at the north of the great desert—in fact, Africa is in terrible danger just now, not so much from devastation or invasion during the conflict as from the "aftermath, when a weary, disrupted, and bitter Europe may cast off the caution that lately has guided the management of African affairs and seek once again quick bonanza returns that do not exist except by sacrifice of the continent's resources and integrity." In other words, a heavily exploited Africa would become a dead Africa, waterless over most of its territory, with dead soils and only remnants of its simple black people huddled underneath the cloudbanks of its escarpments.

As a book packed full of a great variety of information, both descriptive and photographic, with high adventure and some humor thrown in for good measure, "Focus on Africa" tops almost anything of its kind to be found today. It is in the best tradition of the American Geographical Society, perhaps for the reason that it is not "patterned" as a book on physical or economic or any other kind of geography. Dr. Light—he is, by the way, the M. D. kind of a doctor, neurological surgery, Kalamazoo, Mich., and he takes his vacations "in the air"—apparently is profoundly interested in this old earth of ours, and for an observer from above ground he has an amazing knowledge about what is happen-

ing on the ground. The African flight started at Capetown in November of 1937 and zigzagged northward throughout all of that winter, as the two adventurers made a thorough study of South Africa, the Rhodesias, Mozambique, Tanganyika, Kenya, and Uganda, and then followed the course of the Nile from its source—and the source of life in Egypt, no matter what the outcome of the present struggle—to Cairo. Homeward bound, above the sands of Northern Libya, they noted some revealing facts about Italian fortifications and settlements, no doubt a shambles today!

"Focus On Africa" is much too extensive to be reviewed in detail—a complaint that could come only from a reviewer, because once the general reader "gets going" he will not stop until the last sentence is read, the last photograph scrutinized, and then he will wish for more. There is not a dull sentence in the text; not a shoddy photograph in all the 325, mostly aerial, that are grouped regionally, with flight maps conveniently placed so that the reader may know without atlas-work just where on the great continent a certain noble and "engaging" male lion came near and stood still "in boastful display of his superb figure;" where in Mozambique, they have a 5-year plan to grow cotton—somebody had better tell them about cotton and our South! Where, in the form of the Great Escarpment, can be found the reason for South Africa's water problems; where, here and there, agricultural advancement, with soil and water conservation practices, shows that the young countries are on the right track.

When, in flying over Africa with Dr. Light and Mary Light, you start northeastward toward Nyasaland, land of dreams and a long lake, you are inclined to think of the superfluity of boundaries here in this East Africa of contrasts, of mystery, of volcanoes and uplifted escarpments, of magnificent temperate and humid zones and burnt and desolate places, of fresh and salt lakes, of rift valleys, formed no one knows how! You think also that perhaps Africa has reached the stage when a continent needs a special god, to plan an over-all future so that things may not go wrong with its simple people, its strange soils and forests, its wild beasts, and its escarpments, catching rainclouds. Perhaps we of the United States of America can help when and if our help is wanted, at least with exchange of experiences and accomplishments thus far in soil and water conservation. We, ourselves, might greatly profit if, for example, we knew more about the work of Clement Gillman, famous geographer and now water consultant to Tanganyika Territory—he, while surveying for a railroad, found that the native people were isolated in "oases", and thus discovered the water needs of the region. An extraordinary population survey of the "teeming millions" that do not "teem" ended in soil and water conservation, but no railroad!

One series of aerial photographs, numbered 158 to 169 inclusive, with the half dozen pages of text describing the soil conservation and tsetse fly experiments around Moshi, on the slopes of Kilimanjaro, is a "must" for American conservationists. There the ecology of soil-conserving vegetation in relation to the tsetse is being studied intensively, and the native people are being taught soil conservation and water-storage methods in order to preserve the fly-free agricultural areas for human habitation.

Farther north, in Kenya and Uganda, the aerial adventurers literally came down to earth and learned much about the tremendously important British "experiments" in government, consisting, in Uganda, chiefly of the development of native ways and laws and traditions, and in Kenya, of modernization based upon high agricultural standards on the part of the white people and slow and careful training of black tribes living on huge "native reserves." Dr. Light describes with enthusiasm the famous British animal-husbandry experiment station not far from the Eastern shore of Lake Victoria, in the Kavirondo kraal country, and a fine farm cut out of virgin forest on the slope of Mount Elgon where he found growing wheat, corn, apples, coffee, peaches, citrus fruits, asparagus and even gooseberries—on the equator!

There were two unforgettable interludes in the African flight—one on the ground with the lions in Serengeti Game Reserve in Northern Tanganyika; the other in cloudland over the Equatorial Mountains that rise in a giant crescent about Lake Victoria. "There seems to be a relationship between these elevations and the rift-valley system; many of the peaks arise directly in the course of the rifts; others stand nearby." The Ruwenzori Ptolemy's "Mountains of the Moon," source of life in Egypt and almost legendary up to a decade

ago, were to Dr. Light a dream come true, when finally after hair-lifting attempts there came a day of heavy ground fog, and a "dull-red ball with brown, misty edges"—the sun—and a clear upper sky—the massif was exposed to view along its entire length, an Arctic waste at the equator, in a "region . . . remote and detached, a world by itself." But see the magnificent photographs, Nos. 195 to 203, of this mysterious highland where it rains incessantly for Egypt's sake.

The only thing lacking in this splendid volume is a relief map of Africa, all in one piece, so that the would-be weather-wise could come a little nearer understanding why it is that the great equatorial continent's scattered mountain blocks save it from being one gigantic desert—why the Karroo—why the Riet and the Modder are "wadis"—even why, perhaps, "a frozen and desiccated leopard" inhabiting the dreadful arctic wastes of tropical Kilimanjaro, "Grand Old Monarch of Africa"!

"Focus On Africa" has a foreword by Isaiah Bowman; a remarkable Bibliographical Acknowledgement of 167 items; a final chapter on the airports of Africa, especially places not to land; and, throughout, the fine touch of Dr. Gladys M. Wrigley, editor of the American Geographical Magazine, who edited the text for publication.

EL SALVADOR SOILS PROBLEMS EXPLAINED BY STUDENT



Senor Jauregui uses a map to drive home a point in his discussion of erosion and production problems of El Salvador with Chief H. H. Bennett of the Soil Conservation Service.

His country, the Central American Republic of El Salvador, faces serious agricultural adjustments to provide food for its 2,000,000 inhabitants, according to Senor Jose Salvador Jauregui.

In Senor Jauregui's opinion, two of the grave problems menacing the rate of agricultural production in El Salvador are soil erosion and deforestation. It was not until the floods of 1934, observes Senor Jauregui, that the farmers and plantation owners took cognizance of the devastations caused by the unchecked running waters of the mountainside. In that year, he tells H. H. Bennett, Chief of the Soil Conservation Service, the torrential rains flooded all the agricultural lands of the central and western portions of his country, destroying or damaging most of the crops in those regions.

Senor Jauregui explains that, due to overpopulation in El Salvador, every inch of available land is utilized for the production of crops. The country as a whole is very mountainous and for this reason much of the farming must be done on the sides of mountains and volcanos. Very frequently the slopes are almost vertical. Jokingly, he adds that the corn fields on those steep slopes seem to have been planted by the use of a shotgun.

Clearing the land of its protective vegetation has necessarily exposed it to water erosion, and induced problems now assuming alarming proportions.

Coffee, as Senor Jauregui points out, is the main commercial crop produced in El Salvador. Coffee constitutes 92 percent of the exports. It is produced in the higher lands and on mountainsides. Sugarcane occupies the largest portion of the flat lands in Central and Western Salvador, but very little sugar is sent to other countries. Most of it is consumed locally. Other leading crops are cotton, henequin (or sisal), indigo, perubian balsam, corn, beans, and rice. The last three constitute the main staple food crops in El Salvador.

Senor Jauregui is in this country for two years under the auspices of the Office of the Coordinator of Inter-American Affairs. He was awarded an Inter-American Trade Scholarship, and plans to acquaint himself with the various phases of agricultural organization in the United States. Included in his program is a special study of soil and water conservation.

For REFERENCE

Compiled by **ETTA G. ROGERS, Publications Unit**



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THE AGRICULTURAL POLICEMAN OF HAITI

BY
G. L. CRAWFORD

The Haitian agricultural policeman is usually big, strong, carries a long, sharp knife similar to the machete, receives \$10 to \$15 per month.

The development and improvement of agriculture may be approached in a number of ways. Usually it is done through educational channels, but it may be accomplished through regulatory methods. In the States we think of improving agriculture by the processes of education and demonstration, while the regulatory feature of the program is carried out through quarantine laws passed by Federal and State governments to control the movement of plants and animals, primarily to avoid the spreading of diseases. By the reverse method, however, the regulatory approach can be made at the beginning of a general improvement program, with the educational feature to follow later, as is being done in Haiti at the present time.

Haiti—with a population of 3,000,000 people and with an area of 10,700 square miles of land, much of it rugged and mountainous—passed a law in 1937 regulating the planting of crops according to the slope of the land, controlling the handling of the forest program, and regulating the breeding and handling of livestock. This law not only outlined the program to be followed by the farmers, but it provided for the employment of officers to enforce this regulation.

The officer, or agricultural police agent, must not be under 25 years of age. He must know how to read and write and have all of his civil and political rights. In other words, he must have been an honorable citizen enjoying full-citizenship rights of the country. He wears a uniform and a distinctive badge. The agricultural policeman is properly armed and usually carries a long knife as he patrols his well-defined area in the rural regions of Haiti. Some of the laws which he enforces are outlined in the following paragraphs.

Unless by special written authority obtained from a qualified government agent, the farmer is not permitted to injure, cut, prune, or burn any trees on

land where the slope is 30 percent or more, or within the limit of 325 feet around the source of rivers, or within 160 feet of the borders of rivers and creeks, lakes and ponds, and reservoirs. Very strict and definite regulations govern the production and cutting of forest trees, and apply also to the trees growing within the streets of cities, towns, and hamlets as well as in the country. It is further forbidden, unless special written permission is granted, that annual crops be planted on land where the slope is 45 percent or more, around the sources of rivers closer than 325 feet, and within 160 feet of the borders of rivers and creeks. Furthermore, these regulations are made a part of all farm leases, so that they apply equally to the renter and the owner.

An offender is immediately taken before the judge and a hearing must be held either on that day or on the following day. The penalty provides for a fine, or imprisonment for 1 to 30 days. In case of repetition the offender will receive both fine and imprisonment. Also the police officer will be fined by omission or negligence in carrying out his obligations. This law went into effect on June 23, 1937.

These restrictions may appear to us to be a little drastic, but we must consider that Haiti is depending almost wholly upon her agriculture for a living, that more than half of the island is rugged and mountainous, and that the farmers as a whole are uneducated. The farmers have crude farm tools and depend largely on clearing land by cutting the trees and burning them, thus destroying their entire value. This practice already has gone on to an alarming extent. Much of the bared topsoil on the mountainsides has been washed to the valleys with the result that concentration of population is becoming extremely acute in the lower regions where the soils are more productive.

There are a number of well-educated and trained agriculturalists in Haiti who are exercising capable leadership. They are aware of the danger to their country if destruction of its natural resources is allowed to continue. Realizing the gravity of the situation, they feel that they do not have time to wait for the slow process of educating the masses. They must first establish strict regulations to control the remaining natural resources and then gradually educate the farmers in the ways of conserving their soil and timber and of improving their livestock.



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UNITED STATES DEPARTMENT OF AGRICULTURE - WASHINGTON

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WELLINGTON BRINK
EDITOR

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SOIL CONSERVATION

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SECOND INTER-AMERICAN CONFERENCE ON AGRICULTURE

BY EDWARD H. GRAHAM¹

Called by the Mexican Government's Secretary of Agriculture, Marte R. Gomez, the Second Inter-American Conference on Agriculture held at Mexico City July 6-16 was attended by representatives of all the American countries of both continents. In the words of the Secretary, the purpose of the conference was "to formulate the basis of a continental cooperative plan for the development of agriculture and to establish a closer connection between the official and private organizations that have charge of this important branch of production." Dedicated to the facilitation of American agricultural production and distribution in order to aid the United Nation's war effort and produce the necessary food and fibre for the peace that follows, the conference was opened by President Avila Camacho at Chapultepec Castle, traditional home of Maximilian and the Empress Carlotta during Mexico's uncertain rule by France. A great many appropriate subjects were freely discussed and 76 resolutions contributing to the purpose of the conference were adopted. So comprehensive were the agenda that the work of the delegates was apportioned to 13 committees, meeting separately except at plenary sessions.

The American delegation was headed by United States Secretary of Agriculture, Claude R. Wickard, and was composed of a large retinue of specialists from the United States Department of Agriculture and agricultural colleges as well as from other institutions and governmental bureaus. The brisk, cool climate of the Mexican plateau, on which Mexico City is situated at an altitude of 7,434 feet, offered a stimulating environment for the deliberations of the delegates, and the city itself, a thriving, modern metropolis of 2,000,000 persons, provided a most delightful setting for the extremely hospitable welcome extended by the Mexican Government and people.

Among the resolutions adopted, food and crop production received primary attention, its importance emphasized by the war needs of the United Nations. Correspondents were named to study food distribution and eliminate artificial restrictions that might impede it, develop cooperative methods for equitable distribution, and adopt measures to reduce

surpluses. Increased production of essential food crops, and national and international subsidies to accomplish this end, were also recommended. It was suggested that American nations take steps to facilitate the exchange of fruit and to stimulate private interest in the storage and refrigeration of foods. The study and production of dehydrated foods were emphasized, and it was resolved that existing institutions and new laboratories accentuate research upon new uses for surplus crops.

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Equitable agricultural production in each country was sought through international cooperation and the American governments agreed to adopt measures to discourage unfair competition, especially as it results from the war effort. Plans were suggested for increasing the production of vegetable oils and American countries were urged to introduce and cultivate plants producing tea, spices, tannins, insecticides, drugs, fats, oils, and resins. Surveys were also recommended to determine American supplies of these and other agricultural resources, such as rubber, woods, fibres, cellulose, waxes, gums, and medicinal plants. Lifting of restrictions on production and use of *yerba mate* was sought and a study was directed toward the elimination of restrictions on the importation of vegetables. The conservation of meat was encouraged through use of private capital under Government direction.

It was resolved that, where the climate is suitable, American countries will introduce tung and experiment with its production; the delegates also agreed that the Pan American Union and interested governments would do well to establish a Cacao Institute in Ecuador and other cocoa-producing countries, to exchange techniques, compile and publish results. The conference recommended the adoption of methods of conserving rubber, as well as the establishment of plantations, and encouraged use of agricultural products in the manufacture of synthetic rubber. Sugar and starchy products, as corn and wheat, not otherwise used as food or in the chemical industries, are to be converted to alcohol for the production of synthetic rubber and motor fuels. Forestry surveys, training, and research were recommended, together with the establishment of a forestry section in the Inter-American Institute of Agricultural Sciences.

It is of significance that the people as well as the products of the land received thoughtful discussion, the improvement of rural conditions being treated in no less than 10 resolutions. At study of American rural living conditions was recommended, with improvement of education and sanitary conditions stressed, and the Pan American Union was asked to consider the founding of a section to study distribution and colonization of rural peoples. Native farm customs and traditions are to be studied with a view to preserving customs that are useful and eliminating those that are detrimental. It was suggested that typical rural developments—cooperatives—be established to demonstrate economic and social organization, and that experiment stations and agricultural schools study the most useful plans and materials for rural homes and teach farmers how to

RESOLUTION NO. 30

Soil Conservation and Technology

(Translated from the Spanish)

WHEREAS:

Much land in America has been seriously damaged or ruined by erosion, and at a rapid rate, through lack of adequate conservation,

IT IS RECOMMENDED:

I. That great attention be directed toward maintaining and increasing the productivity of the soil by means of erosion prevention and control measures, the conservation of moisture, and the use of adequate farm practices.

II. That there be established among the American nations, means for training and equipping specialists to develop practical work programs for maintaining and improving the productivity of the soil through these same methods of erosion prevention and control, through improved farm practices, and by interchange of ideas, data, students, technicians, and other means.

III. That the localization, extension, and conditions of areas affected or menaced by erosion be determined by joint reconnaissance that will point out methods and procedures satisfactory for the development of programs that will make possible the adoption of standard practices for erosion prevention and control.

IV. That in regions representative of the various types of erosion problems there be established practical demonstrations of the best-known methods for soil conservation in relation to erosion prevention and control, the conservation of rainfall, and the development of new lands through drainage or other appropriate measures.

V. That an increase in agricultural production be planned, taking into consideration the fact that the improvement of soil productivity through adequate methods of procedure is generally more economical and practical than the opening of new lands for cultivation without employing satisfactory methods of production.

VI. That institutions dedicated to the conservation of soil fertility or to its improvement be organized in the various Latin-American nations.

VII. That the governments of America disseminate the practical knowledge of soil conservation by means of films and that these be placed at the disposal of said governments to be exhibited in whatever manner is most convenient.

use them. The teaching of home economics is to be included in agricultural education, and a study of foods, food habits, and cooking was recommended in order to develop rural dietetic programs.

The biological aspects of agriculture demanded considerable attention. International methods of pest control were recommended as were studies of insects affecting man and animals. Entomologists agreed to exchange results of investigations on the

biology of insects, insect relations to plants, and other entomological information; also to establish procedures for an inter-American plant quarantine. Studies are to be made of insecticides and fungicides, especially of little known plants that are sources of these materials, and standards are to be set up for classifying biological agents that transmit human and animal diseases. The Peruvian Government was commended for wildlife management resulting in a 400-percent increase of its guano birds, and a section in the Inter-American Institute of Agricultural Sciences was suggested for the protection of wild plant and animal life. It was recommended that land management programs consider the biological aspects of their operations on all agricultural lands.

Several recommendations referred to the soil—its study and conservation. One dealt with exchange of information about the physical characteristics of soil, another with chemical characteristics and teaching farmers the care of soil fertility. A permanent committee was set up to establish an Inter-American Society of Soil Science patterned after the International Society of Soil Science, and a uniform system of soil examination and classification is to be adopted, patterned after that of the United States Department of Agriculture and the terminology appearing in the Glossary of United States Department of Agriculture Yearbook, "Soils and Men," which has been translated into Spanish by one of the Argentine delegates. Of prime interest to soil conservationists was resolution No. 30, providing that soil conservation programs be developed in all the American countries, based on erosion reconnaissance and conducted by demonstration method, and that increased agricultural production be planned through the use of soil conservation practices.

The committee on animal industry heard many worth-while discussions, and as a result the conference recommended the control and inspection of all cattle imported for breeding purposes, with the establishment of livestock experiment stations to aid stock raisers. All countries are to hold periodic livestock shows for educational purposes, and they agreed to develop a single standardized cattle register, undertake systematic cattle-tick work, distribute Bangs' disease vaccine, encourage artificial insemination of cattle, and make a cattle census.

The role of transportation was not neglected, and it was suggested that land routes of transportation be improved, especially portions of the Pan American Highway, and that a permanent commission be established in the Pan American Union to facilitate maritime transport. A committee was appointed to

found an Inter-American Bank of Agricultural Credit and a resolution was directed at the establishment of agricultural credit for small farmers, with attention to technical and educational aspects. The conference recommended that each American government, with appropriate technical and financial background, help to organize agricultural producers, especially small farmers in cooperative groups, and protect agricultural workers according to international working agreements. Insurance for agricultural crops and farm animals was urged, and increased use of agricultural machinery, especially by cooperatives, was recommended.

Further resolutions dealt with an inter-American system of agricultural cost accounting and statistics, climatic studies, rural electrification, irrigation and drainage, plant introduction and exchange, importance of social sciences to agriculture, placement of agricultural attachés with the diplomatic representations of all American countries, encouragement of immigration, and agronomic attention to Indian affairs. The delegates believed it desirable that the Pan American Union, in collaboration with the Inter-American Institute of Agricultural Sciences, coordinate all agricultural cooperation and extension, and arrange the exchange of students and experts.

In order that the recommendations of the conference be more than idle promises and take concrete form, it was severally resolved that the papers presented be published, that the American governments keep the Pan-American Union informed of progress in carrying out the resolutions, and that a place be set for another meeting within the next 2 years. Furthermore, the final act of the conference was the appointment of a committee, headquartered in Mexico City and composed of the chiefs of delegates from Argentina, Chile, Colombia, Cuba, Honduras, Mexico, and the United States, to secure the fulfillment of the recommendations of the conference.

The depth and far-reaching significance of what we had so freely discussed, considered and recommended, was solemnly emphasized at the closing session of the conference when President Avila Camacho, in his quiet, firm voice, concluded an instructive and poignant address with the words: "Land and liberty have been invariably, in our hemisphere, united and parallel concepts. Without land, liberty becomes a mere legal notion, lacking reality. Without liberty, the land is barren, for however gigantic the material resources accumulated by the technique of oppression may be, the best fertilizer for the furrow will always and everywhere be the faith of the tiller of the soil in the redeeming quality of his task."

SOIL PUT TO CLINICAL TESTS AT TAR HOLLOW CONFERENCE

BY WELLINGTON BRINK, EDITOR

At Ohio's newly famed Conservation Laboratory the land is the textbook. Soil, water, wildlife, rocks, plant growth, microorganisms—all the pull and play of natural forces—are the working materials.

Countless thrills for the sedulous student unfold along a 3-mile Nature Trail. Writ on the wooded slopes is sober wisdom that man must have if he would dwell amiably in his earthly environment.

Yes, the land is the textbook. And the Universal Mother is the preceptress. There are other teachers, too. They are leather-booted geologists, khaki-clad botanists, ornithologists, and soils scientists, who direct the seeing and help shape the deductions.

Pupils, in other seasons, are teachers themselves. From grade schools and high schools they come; from city and town and rural community. In the fall they return to their classrooms imbued with new appreciation of life's homilies, strengthened in love and understanding of the land and its progeny. They are a tanned and enlightened and well-summered group, expertly tutored in the dramatic story of how to check the rampant raindrop, how to build production by conservation measures. They carry to youth crisply fresh ideas of the interrelationships, the cooperation, the ecology that must prevail for efficient outdoor housekeeping.

On the great stone porch of the headquarters building of the Tar Hollow Camp is an interesting collection which steadily grows with the days and weeks of the laboratory period. There are snakes and bats, ferns and frogs, fish and flowers—the live or mounted trophies of a healthy inquisitiveness. There are soil samples and rock fragments, spiders and snails, zoophyte and animalcule—a fair sampler from the flora and fauna of the 16,000-acre college that is Ross-Hocking State Forest, not far from Chillicothe. The museum evidences the laboratory's chief point of emphasis, which gives to field investigations equality with lectures and notebooks.

Experience shows that this is a good way to propagate both soil conservation and human conservation. Ohio State University allows undergraduate and graduate credits for courses and joins the State Department of Education in giving support to the school. The archetype and direction belong to the Division of Conservation and Natural Resources of the Ohio Department of Agriculture. Ollie E. Fink is in command.

High spot of the 6-weeks laboratory was a 2-day conference (June 27-28) on conservation, nutrition, and human health. This conference, similar to the one of last year, was arranged by Dr. Jonathan Forman,¹ editor of the Ohio State Medical Journal and specialist in nutritional diseases. Even without extensive promotional effort, the soil-nutrition conference overnight more than quadrupled the laboratory's normal attendance.

Speakers included Dr. Wilbur Stout, State geologist; Dr. W. A. Albrecht, chairman of

¹ See Dr. Forman's article, "Conservation, Nutrition, and Human Health," in this issue.

Missouri University's Department of Soils; Dr. Kenneth C. Beeson, Nutrition Laboratory, United States Department of Agriculture; Dr. Paul B. Sears, Oberlin College, author of "Deserts on the March"; Dr. Clarence Mills, professor of experimental medicine, University of Cincinnati; Dr. D. R. Dodd, agronomist, Ohio State University; Dr. C. Langdon White, Department of Geography, Western Reserve University; Mr. Fink, and Dr. Forman.

Addresses were premised on the truism that bodies—plant and animal—are "built from the ground up." With this was coupled consideration of the role open to comprehensive soil conservation in creating healthy individuals, plants, and animals, that society may enjoy the fruits of victory in war and also in peace. A lettuce leaf is a lettuce leaf to the average housewife, but to a scientist a lettuce leaf can be either "merely a lettuce leaf" or else it can be a repository rich in vitamins and needed minerals, depending entirely upon the soil from which it grew. There is an expanding group of physicians, dieticians, and soil chemists who are beginning to draw important distinctions of this sort.

From time to time physicians, dentists, veterinarians, food specialists, and others have noted curious phenomena which seemed to relate geography to biological peculiarities. Horses raised on Kentucky bluegrass raced faster, lived longer. Kansas City packing houses dispensed a superior quality of sirloin steaks.

For a long time, lay opinion was wont to accept such matters as happenstance or to invoke general explanations which did not entirely convince. More recently, however, science has begun to delve deep. At last year's meeting of the American Dental Association in Houston, for example, Dr. Edward Taylor called attention to the tooth-decayless paradise that is Deaf Smith County, Tex. Dr. Taylor found that the soils of this county are unusually rich in fluorine, phosphorus, calcium, and vitamin D—which presumably accounts for the almost total absence of cavities, toothaches, fillings and bridgework in that county. Wheat ground in the local mills is high in protein, contains about 6 times the normal quota of phosphorus. Milk has 30 times the phosphorus ordinarily expected. Vegetables, dairy and meat products are exceptionally high in the elements required to build and maintain tooth tissues. Well water is especially abundant in calcium.

The Tar Hollow conference dug far into soil and nutritional relationships such as these. Lecturer after lecturer affirmed the importance to the national health of maintaining the nutrient content and quality of the soil by conservation and replacement measures. Good farming—conservation farming—was stressed again and again because of the dire consequences to health of what one speaker termed the "under-development of the soil."

Added to the intimacy of soil and nutritional affinities against a background of good or bad farming are close relationships of water conservation, soil conservation and health conservation put in bold relief by Dr. Stout. "What's happened to our water?" asked the State geologist. With maps, charts, simple arithmetic, and Euclidean logic, Dr. Stout demonstrated Ohio's problem and carried through to an answer. He produced evidence that Ohio's water table has receded 19½ feet in 20 years. The sweet water—potable water—table is today limited in the State to a very thin upper crust. With a usual 37.97-inch rainfall, a third is lost in runoff. Flood hazards result, farm supplies of water are vastly restricted, industrial needs are endangered, sanitation lacks constitute a menace. "Some of these days we're going to have to talk recharge," declared this authority, "and the time is not far off. If we can save three one-hundredths of the runoff we can take care of all human needs in Ohio; if we can save three-elevenths, we can take care of our industrial requirements. Most important in effecting a recharge is the farmer, who can do it by soil conservation—contour

plowing, strip cropping, cover crops, farm forestry, all the techniques known to hold the water by simple mechanics, and to improve the humus content and the tilth."

Dr. Mills made clear that the energy to control our environment is essentially a product of that environment, supporting the belief of the ecologist that man is not a detached manipulator, free to do what he will with the world in which he finds himself. He is part of the landscape to which he belongs, obligated to a responsibility for the conditions which determine our behavior and that of our fellows.

Charged with summarization, Dr. Sears made this neat observation: "An essential point that has been brought out in the past 2 days is this: there is no possibility of solving any particular problem of conservation by itself. Rightly, the soil was the center of our discussion, and its relation to health a starting point. But every speaker exemplified the fact that all of the problems are woven into a seamless structure. You cannot solve one without the other."

Closing session was in charge of The Friends of the Land,² a nonprofit, nongovernmental organization which is doing splendid work in helping to shape policy and action in the use of land and water. Dr. Charles Holzer, president of the association, presided at a round-table discussion of how to further through the schools the social necessities of soil conservation. Featured speaker was Dr. John D. Detwiler, president of the Canadian Conservation Association. Dr. Detwiler was flanked by Bryce Browning, secretary of The Friends; and the three editors present—Russell Lord, of *The Land*; Dr. Forman, of the *Ohio State Medical Journal*; and Wellington Brink, of *Soil Conservation*.

Following the round-table, lights were dimmed for a showing of a new Department of Agriculture motion picture "The Land," enjoyment of which was enhanced by a brief discussion of the film and Robert Flaherty, its maker, by Russell Lord, who wrote the original script.

² See Russell Lord's article, "A Report on a Friendly Meeting in Missouri," in this issue.

CONSERVATION, NUTRITION, AND HUMAN HEALTH

BY JONATHAN FORMAN, B. A., M. D.¹

All of our foodstuffs, both in their primary nutrient qualities and in their mineral and vitamin content, are profoundly influenced by the soil in which they grow. The plant products we eat and the plant products the animals eat and which in their meat passes on to us have their "hidden" food values largely determined by the land, good or bad, where they grow.

Conservation means many things to many people. It is such a comprehensive thing. Conservation is concerned with flood control, soil erosion and depletion, farming, wildlife and game, the health of man and his animals as well as the peace, prosperity, and happiness of the people. The trapping of the raindrops and the control of floods belong to the soil conservationist. The nutrient qualities of the soil belong to the soil technologist. The behavior of plants upon that soil belongs to the plant physiologist and pathologist. Then the health of the animals which provide us with food belongs to the experts on animal nutrition and dairying. Although wildlife and game come and go with the fertility of the soil their

¹ Editor, the *Ohio State Medical Journal*; lecturer on medicine (allergy) in the Ohio State University; director-general, International Correspondence Club of Allergy.

problems have special students. The methods of gathering, preserving, cooking, preparing, and serving these foodstuffs belong to the home economist. The study of the needs of the normal human being belongs to the nutritionist. Finally, the recognition of the signs of bad nutrition and the ill health which comes from eating poor foods is a function of the physician. Each of these experts has a fund of knowledge which the others need in working toward an improvement in human nutrition and welfare. It is the human need that always gives value to our endeavors.

Certain facts stand out in any review of nutrition in this country.

First: The value of adequate, balanced foodstuffs in childhood has been demonstrated on a mass basis. Army statistics indicate that today's young men—having been given the benefit of even the meager knowledge available in their childhood of the importance of vitamins in nutrition—are taller, heavier, and in far better general health, on the average, than were their counterparts in the last war—only one generation ago. Our discussion here has to do with improving upon the best. Let us not forget in our desire to reform that our people are the healthiest and richest people who have ever lived on this earth.

The second fact that stands out is this: Marked improvement in health and physical condition of American youth is not enough! All authorities agree that the average American diet is not adequate in the "protective foods" which the children of today need to become more vigorous citizens of tomorrow. This is not a matter of income, for nutritional deficiencies are as common among the so-called "well-to-do" as among the less fortunate. In the more critical growing days of the pre-school child, such deficiencies exist without the parents' knowledge and may provoke serious consequences. In the second year of life nutritional deficiencies still rank as the chief cause of diseases.

Third: Today's resources for assuring optimum nutrition are adequate, convenient, and inexpensive. At no previous time in the world's history have circumstances been so propitious for the convenient, economical provision of an adequate and balanced diet. We have the resources, we have the knowledge. We only need to put to use what we know to insure our children escape from the nutritional dangers of their second year; to insure good sound teeth, thus wiping out the dangers of focal infection and carrying the life expectancy of our people well past the seventieth year.

Medical research made a great contribution to human welfare when it began to dig up positive evidence that improper food and a consequent bad nutrition was the underlying cause of many diseases. Not only organic diseases were so identified but bad nutrition was found to interfere with the proper working of the bodies of both animals and human beings. The illnesses produced by deficient foodstuffs were found to be for the most part chronic and crippling in character, creating in themselves scores of social problems. Chronic illnesses due to bad nutrition are the largest single factor in the problem of the aged. In fact, if we cannot give our old people a continued active, productive life

such as we now have the knowledge to do they threaten to overwhelm our social structure.

We now know for sure that certain definite diseases are due to certain specific deficiencies in our diet. We are also beginning to appreciate that there are literally millions of people and animals who are suffering from a lack of proper food and who do not exhibit positive disease. They enjoy poor health. They have such a loss of natural vitality that they have little or no vigor. They just are not well. They have an increased susceptibility to all sorts of infections and degenerative diseases. How to restore these chronically half-sick persons to robust health by getting them into a state of optimum nu-



The way of Nature is the way of conservation. Health of man depends on health of land. On a bridge along the Nature Trail, David Herrman of Soil Conservation Service, Dr. Forman, and Frank Crow of Forest Service plan a concerted attack.

trition has been and is our fundamental social problem.

We already know enough about improving our daily menus so that *each of us on the average could add seven useful, active years to our lives if we would but put into practice what is known.* We know also that nutrition has a great deal to do with the general physical, mental, and spiritual well-being of all of us. Richard Osborne Cummings aptly summarized all this when he wrote: "The science of nutrition may be said to have advanced to the point where it is firmly established, not only as a branch of presenting medicine, but as a *major instrument of social policy.*"

The starting point for the solution of our problem of how to get a strong, healthy, and happy people living in an effective social order is in the soil. While much remains to be learned, we do have a great deal of evidence that the lack of physical and mental vigor of our people is related to the deficiencies in the soil and in the foods produced from such soil. There are areas in the world where human or animal foods, or both, are inadequate because the soils there lack lime, phosphorus, sulphur, iodine, copper, iron, cobalt or minute traces of other essential minerals in forms which are available to its plants.



Man's estate being cheerfully inventoried by members of the Fourth Estate. Represented, left to right, *Soil Conservation, The Land, The Ohio Medical Journal*, by editors Brink, Lord, Forman.

Evidence begins to accumulate that much damage has been done to the social and physical health of our people through the depletion of our soils. In recent years some have been greatly concerned with what they call adequate medical care for the underprivileged. This is a generous gesture, but it makes little difference to society in the long run who gives what colored pill to whom. Pills and potions relieve suffering and at times conquer infection. Proper nutrition through eating of foods rich in nutrients would have prevented this sickness in the first place.

Let me illustrate what I mean by the studies which have been made upon the Cincinnati Negro in the slum areas where food supply, food preservation and food habits are all bad. They die like flies from rheumatic fever, tuberculosis, and other diseases brought on by lowered resistance. In a Negro suburban village under average suburban standards of living the relatives of these same Negroes die at the same rate and with the same diseases, as do the white people of the neighboring towns. No one is particularly interested in the health problems of an individual colored citizen in these slums, but once his malnutrition has lowered his resistance and he develops tuberculosis, he is taken to a magnificent institution with marble halls. Doctors and nurses are provided in abundance to study his case and serve him. Too often it is too late. The farm crops we didn't raise and the milk we didn't produce would have prevented him from ever having been infected with tuberculosis.

Or again, some 10 years ago the Dental Society of Pennsylvania offered to fill free of charge the cavities in the teeth of all the children whose parents were on relief. This, too, was a noble gesture on



Top row, left to right—

Jonathan Forman, M. D., editor, *Ohio State Medical Journal*; Russell Lord, editor of *The Land*; Charles Holzer, M. D., president, Friends of the Land; Walter Frye, Wooster, Ohio, prominent in the work of the Izaak Walton League.

Middle row, left to right—

Arthur Harper, field naturalist; Ollie E. Fink, director of Conservation Laboratory; Dr. C. Langdon White, Department of Geography, Western Reserve University; Bryce Browning, executive secretary, Friends of the Land.

Bottom row, left to right—

Dr. Kenneth C. Beeson, Nutrition Laboratory, U. S. Department of Agriculture; Dr. Paul B. Sears, chairman, State Conservation Education Committee; Dr. D. R. Dodd, agronomist, Ohio State University; Frank Crow, supervisor, U. S. Forest Service, Columbus, Ohio; Dr. John Detwiler, president, Canadian Conservation Association, London, Ontario; Wellington Brink, editor, *Soil Conservation*.

the part of the dental profession of Pennsylvania and cost these dentists an immense amount in time, energy, and money and material, but the cavities continued to develop faster than the dentists could fill them because the children weren't getting the foods rich in calcium and vitamin D. It is, therefore, to be hoped that our attention will not become fixed on some scheme for getting sick people to physicians but rather that we shall realize that they are sick and always will be sick with one disease or another as long as they live if they are not given proper nourishment. Prevention is the thing that is needed in meeting this problem.

In this connection I always like to cite the experi-



Organizational brothers-in-arms figuratively help to cross the bridge from exploitation to conservation. Two friends of two neighbor Nations talk over the problems posed at Tar Hollow. Left is Dr. Charles Holzer, president of Friends of the Land; right, Dr. John Detwiler, president of Canadian Conservation Association.

ence of the people of my own city. Some 40 years ago, hundreds of people were stricken with typhoid fever every summer. The physicians of the city literally lived off typhoid fever. The citizens determined to do something about it. Mass meetings were held. Opinion was sharply divided. Physicians were on both sides. Now, if the majority had been thinking as we have been in the last 15 years, they would have hired 200 doctors, 100 nurses, subsidized all the hospitals, and given the people of Columbus adequate medical care and a whale of an annual tax bill. Fortunately, more practical minds prevailed in those days and the city of Columbus obtained a pure water supply. Typhoid fever promptly disappeared. Now the adequate care of typhoid fever in our town costs no one anything.

If we restore the fertility to our soil, grow nutritious fruits, plants and vegetables on this recharged soil, and get our people to preserve and prepare them properly so that all may have a well-balanced diet, those diseases which give rise to this problem of adequate medical care will pretty much disappear.

It's to be hoped that we are at the beginning of an epoch when it becomes the duty of society, as a matter of public health and welfare, to see to it that all its members get a diet which squares with the scientific standards of "an optimum diet." To me this means not doling out foodstuffs and vitamin pills. It means seeing to it that American foods are made rich in the essential elements of nutrition so that all can get them and be sure that they are in the foods they do buy. Finally, there must be a change in the sense of values which many of our people have. We must increase our natural production of foodstuffs by at least 35 percent, for we never have raised more than two-thirds enough to meet the minimum dietary requirements. It's true that nearly two-thirds of our people are more or less lacking in proper foods, either through ignorance or poverty, but when three-fourths of the automobiles in America are driven by people earning less than \$20 per week I am convinced that our immediate problem is the development of a proper sense of values.

The immediate decision for most of our people is to choose between a car, movies, store teeth, unpaid doctor bills, and good food with its attendant good health.

We are all agreed that education is necessary if we are to make good citizens out of our children, but our children cannot get what they should from their teachers if they are hungry. I refer here not so much to apparent hunger as to the so-called "hidden hunger."

Deficiency in vital food elements is widespread among our school children. This has been brought about by our insistence upon overrefining our foodstuffs, and *the depletion of our soils of their essential minerals through bad farming practices*. It has never seemed sensible to me to spend large sums of money on teachers, buildings, and school books, and at the same time neglect the health and nutrition of our pupils. It is a well-established fact that undernourished children lack the mental alertness necessary for learning.

We must, therefore, pay much more attention than we have in the past to this matter of eating for health. I have, and I hope I can give to you, a viewpoint on this matter of health which differs from the usual conception. Too many of us think of

health as a condition which merely keeps us out of the physician's office. True health isn't that at all. Good optimum health is a condition of the human body in which there is a joy of living, a buoyance, a robustness, *a health plus*—I hope you get the idea. When people are physically fit, they are alert. They have endurance and *do not* tire easily, and what is usually not emphasized, they do not worry. They meet the social problems of life with common sense and make the necessary social adjustments. Most of the strange reactions in our social evolution, and unsound ideas, spring from brains that are improperly nourished. I am sure that you have never seen a well-nourished animal or child that was not reasonable and free from worry. Our worries and nervousness do great damage to our bodies, but they begin in a nervous system that is a victim of some "hidden hunger." So, if we are going to have children who can be properly educated, we are going to lengthen the lives of the American people at the other end of the span; if we are going to give them a capacity to do the tremendous amount of work which must be done in the next few years without rebelling, and if we are going to give them the fortitude and courage that is going to be necessary in each of us for the job of rearranging this world so that an enlightened and happy democracy can survive, it is going to take the very best nutritional state in the bodies of all of us.

A good national nutrition program begins with the individual. Each person must know how to select his own diet. The correct use of foods must become the popular thing to do.

Good nutrition depends upon many things. We must get good foodstuffs, rich in all the necessary elements, we must take good care of it so as not to lose those elements in storage, in preserving and in shipping. We must so prepare the food for the table that none of these essentials is lost. We must then eat of such a variety of these wholesome dishes that we get proportionately the right amount of each of the essentials. We must have a good digestion and be able to assimilate what we eat or all of our efforts have been in vain. Furthermore, foodstuffs cannot be properly used unless we have a moderate although adequate amount of physical exercise to maintain bodily tone. For these reasons the little-concentrated-tablet idea of nutrition must go. We need the natural foods.

Our tissues are made up of a series of building stones in various combinations, so we have to get a wide variety of protein in order to build our own protein (tissues). Of course, meat represents a source pretty much like our own tissues and of this we must get an adequate supply. Our interest in

tissue building was very much aroused in the first World War when the reduction in food supplies in certain countries was accompanied by cases of swelling, first among the poor in occupied or desolate areas, in prison camps, and later in the general population. The disease, it was later discovered, had been recognized for centuries under such terms as "hunger swelling" and "prison dropsy." It has occurred in epidemic form in many of the recorded wars of history, both among the troops and in the civil population. A similar dropsy occurring in malnourished infants and in those fed principally upon starches and sugars has long been familiar to our baby specialists. In 1917 it reappeared and attracted much attention in Austria where large numbers of the civil population were stricken. At first it was thought to be some one of the infections, and reports came out that large numbers were dying from relapsing fever, typhus and dysentery. The great interest which it aroused at that time led to numerous studies, with the eventual conclusion that the disease was due primarily to lack of adequate protein. One can speculate as to how much of this is prevalent in continental Europe at the present time. There is little danger of its appearing in this country except among a few food faddists. This is one of the reasons that Britain is asking us for the protein foods instead of the grain we are so anxious to raise for them. We have an interest also in the fact that when this condition interferes with the growth of an infant or child nothing much can be done to restore the damage which it has wrought. If this war lasts as long as some of us believe it will, then protein deficiencies will become a point of major importance in certain countries because of its permanent damage to the children of that country.

Let us stop for a moment to discuss the basic foods and see why so many people have vitamin deficiencies while still consuming in a large part the proper types of foodstuffs. There are four very important factors here. They are: Over-refining of foodstuffs, bad food habits, price rationing, and *foods grown on depleted soils*. The increase in the consumption of sugar and starches is the major bad habit of the American people. Our white flour and sugar give us only energy-producing substances and do not contain, as do whole grains of cereals, the fruits and vegetables, the vitamins which are necessary to burn up and utilize sugar and starches in the human body.

Let us assume that an individual requires 2,500 calories to furnish the energy to make his body go. He is supposed to get this from a balanced ration of tissue-building substances (proteins), starches and fats. Let us suppose that he gets around a thousand

of these calories from these devitalized sugars and starches. There are, therefore, only 1,500 calories left with which to bring in the vitamins and minerals necessary to burn up all the foodstuffs he has eaten for the day. It is not possible for him to secure the required amount of these vital substances from these remaining foods, even though they should happen to contain a large amount of vitamins. In order to correct this deficiency it is necessary to insist upon the use of whole-grain flours and natural fruits and vegetables in the place of sugar. It may be necessary for the doctor to reinforce the nutritional program of such a person by adding drug store vitamins and minerals to his diet until he can get him straightened out. But in order to correct this deficiency permanently there must be a decided reduction in these refined products. The sugar intake must be lower; in fact, there is no need for sugar at all. It's too bad for our Nation's health that sugar isn't rationed even more severely than was originally contemplated. We could very well give all our sugar to make explosives. We should get what we need in the way of carbohydrates from natural sources by eating vegetables, fruits, and whole-grain cereals.

White bread is not the staff of life. It's not desirable that man live on meat alone or on any other food alone. We must have a balanced ration. Certain it is, however, that we should have one good helping of meat each day and that each of us should get some internal or glandular organs rather frequently. I would like to say once a week, if there were hearts and livers and sweetbreads and brains enough to go around. Then, once a week seafood and fish from the ocean is to be substituted for the meat. We often overlook the important fact that seawater contains the minerals which are so necessary for human nutrition, and that the animals of the sea use these in building up their bodies. This is the reason that the early population gathered along the seacoast where fish, mollusk, and seaweeds were easily obtained.

Primitive man ate all of his grains, and the nearest thing to sugar in his life came when he had the good fortune to rob a bee's nest; but everyone, it would seem, is trying to force sugar on us—cakes, pies, candy, sodas, delicacies, and carbonated beverages. All of our alcoholic drinks come in this category too. We consume around 89 pounds of the 130 pounds of sugar which is produced for us. The rest goes into industry. Quite a good deal of it comes back in beer and fortified wines. This 89 pounds per year of sugar is still more than one-fourth of our daily caloric needs. Nutritionists tell us that we shouldn't get more than one-tenth of our

calories in all our sweets together. Our grandfathers didn't eat quite 14 pounds of sugar per year and it's just this that deceives the conservative who says, "My grandfather didn't know about vitamins and minerals, and he lived to be 100." Because of milling processes when your grandfather ate a slice of bread he got a right good helping of vitamin B but it's almost all missing from yours.

Fats play an important part in human nutrition and I have the personal feeling that we should use them in their natural state. The unsaturated fatty acids, especially oleic, are necessary. This has been shown to be doubly true for my patients with allergic skin troubles. Fats were difficult for primitive people to get. For the most part they had to go to nuts and seeds because most of the game that they were able to catch was not too well supplied with fat, and they had no good way of extracting it or of keeping it. The American Indian used to crack and boil up hickory nuts, strain off the sweet oil and use it for shortening. Now fats await us on every hand. Butter, lard, more than 50 kinds of cottonseed preparations, coconut oil, and many, many others. It is very easy to abuse these highly concentrated foods. For instance, most of us will eat three tablespoonfuls of butter, six of cream, two of salad dressing every day and consider it a modest allowance of fats, indeed. Translate this into potential body fat and it's 73 pounds in a year.

Fats are not only a good source of nutrition, but are effective as supports and protection for several of our internal organs. Nutritionists agree that about one-third of our calories, or units of food energy, should be provided by the right kind of fats. The best types are food products such as butter and lard.

It is not necessary to eat unduly large quantities of fat to get a third of your calories. Fats are highly concentrated fuels for body use, supplying more than twice as many calories per ounce as carbohydrate foods (starch), or protein foods (meat and cheese).

Fats like butter, lard, and meat fat exert a beneficial effect on digestion by slowing up the process. Hence, they are filling foods which stay by the body, giving it a feeling of satisfaction and postponing the pangs of hunger. This is one of the many reasons why enriched bread and butter is a splendid dietary combination.

Next to butter, probably our most popular food fat is lard, although there is a wide use of excellent vegetable shortenings and oils. Like butter, lard is about 98 percent digestible.

Another advantage of such fats in the diet is their sparing action on the body's needs for certain

vitamins, such as thiamine, or vitamin B₁. If fat is lacking in the daily fare, more of this vitamin is needed to help utilize energy foods.

Other vitamins, particularly vitamins A, D, and K are associated with and dissolved in fats, which likewise contain a substance known as linoleic acid, as necessary to life as any vitamin. For all these reasons, fats are valuable parts of our daily diet.

We are not eating too much in the sense of bulk and need not eat less. We must merely stop eating concentrated foods because we get thereby too many calories. The fastest way to grow old is to overeat, but the weighing of food and the counting of calories is a hopeless requirement. You may set it down as a practical rule that if you are maintaining your weight you have struck a balance between your intake and your requirements.

Popular ways of dying after 40 are twice as frequent among those who are overweight as among those who are of normal weight. To get back on a diet of vegetables and fruits and good meat will make it unnecessary to fight with the calories because they will automatically balance themselves. We are not asking you to leave the table hungry, for the fundamental of a good meal is the contentment of a satisfied appetite. We are asking you to broaden your food education and to discover the pleasures of large vegetable salads, green leafy vegetables, fresh fruit desserts, the double pleasure of the foods that will keep you young instead of making you grow old.

In these days when we hear so much talk about vitamins, it's equally important that we consider the role of minerals. For just as frequently there is a deficiency of a vital mineral which has been brought about by over-refining our foodstuff, introducing an overdose of some other mineral which in turn affects the availability of this one by the natural absence of the mineral itself from the soil or by its depletion through bad farm practices. Right here it is to be noted that the mineral content of roots and stems and leaves will vary a great deal more than will the seeds and nuts. So, too, will nature sacrifice the body of the mother animal or human to maintain a decent mineral level in the milk. Nature will make every effort to reproduce the individual. We are just beginning to learn the importance of our mineral metabolism and we are hoping that the new Plant, Soil, and Nutrition Laboratory of the Department of Agriculture will begin to bring us information. Tremendous strides should be made in the next few years in detecting mineral deficiencies in the soil and what these deficiencies do to plants and in turn to the animals that feed upon these plants and finally, to man who eats both the plants and the animals.

From the long-range point of view the most serious threat to our civilization is the depletion of our soil of its vital minerals. I would like to emphasize that we have destroyed the mineral resources in our soil at a constant rate.

This question of food is of the greatest importance in this war, for it is generally agreed that "Food will win the war and write the peace." Now, the sad truth is, we in the United States have never had enough food to go around. We are the healthiest people in the world, but this has been through the saving of the lives of babies and of young people. To give our people the diet we have talked about here it will require at least 1,500,000 more milch cows; 1,500,000 steers and veals; 1,500,000 pigs; for the green and yellow vegetables some 7,000,000 more acres of truck farming. The greatest potential market for American farmers is right here in America.

We must develop an adequate sense of values. In Washington they have harped for the last decade upon the fact that one-third of our people are ill fed, ill clothed, and ill housed. On the other hand, they tell about agricultural surpluses and the necessity of export trade.

Possibly this long and cruel war in which we are engaged will bring us to our senses. And when we do get our senses back we shall realize *the need for conserving the minerals in our soil*. And we shall never again be guilty of allowing anyone to have them who does not return them to the soil from which they come.

The German Government compelled its citizens to eat whole-grained breads; and these with cabbage, soybeans, a little meat, and a little animal fat to supplement synthetic fats developed from coal, have made it possible to develop an army with a magnificent physique. This has been purely imitative. The German scientists took the available knowledge on nutrition, most of which had been worked out by American students, but they have applied it on a vast scale, pretty much under compulsion.

The results have been brilliant. Those starving turnip waifs of Herbert Hoover in post-war days were made into the magnificent specimens of the Third Reich. More recently they have given synthetic vitamin C to their troops and their school children along with certain manufactured vitamin B concentrates. They have also used synthetic fat-soluble vitamins A, D, E, K. These things, together with the good use of cabbage, black bread, and soybeans, make it very unlikely that Germany will collapse this time through hidden hunger. It's interesting to note in the last military medical journals available from Germany that they are finding

out in practice what we in America have found out in experimentation; namely, that these man-made vitamins are not as good as the ones God supplies in the natural foods. Most recent report, for instance, shows that more than 25 percent of the crack pilots are suffering from bleeding and infected gums, in spite of an unlimited amount of synthetic vitamins.

The German leaders have also made a diabolical use of this information on nutrition. They have placed it in reverse in their subjugated peoples, so that these people lose their will to fight, they accept their lot, too tired to object, and any plans for invading the continent of Europe cannot expect to find millions of Germany's enemies ready to arise overnight. It will take thousands and thousands of tons of vitamin-rich foods to get them into a condition where they are capable of even wanting to take up arms.

We are now engaged in putting back some of the vital elements which we have taken out of our food-stuffs. For this we have chosen a most unfortunate term of *enrichment*, when we are only putting back a part of that which we had stolen. What are the dangers which may be incurred in the fortification of our foods with vitamins? The dangers are two: First, we know only a part of the truth as yet about the number of vitamins required for health. Second, commercial exploitation of such additions may result in our public falling into the error that artificial additions are just as good as the vitamins that occurred originally in foodstuffs, or that this exploitation may result in price increases which would remove these enriched foods from the reach of the very group who need them most. This enrichment has already cost the flour industry many millions of dollars, to which they have very patriotically submitted. Placing more expensive vitamins into the bread is almost certain to raise the price.

Since I began to take an active interest in Ohio's nutrition program, I have continually warned against a soothing statement that many have made, that "in our last war our food problem was one of production and this time we have a surplus and our problem is simply one of distribution and use." Apparent surpluses have a way of disappearing almost overnight, especially in times of war. We can afford to think twice about our boasted excess of grains and other foodstuffs. Whenever the war ends, huge amounts of wheat, fats, and meats will be required to ward off starvation, malnutrition, and epidemics which always feed upon weakened bodies of its victims.

Preservation of food, eating of apples from our own trees, raising our own gardens, is the contribu-

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THE NUTRIENT QUALITY OF THE SOIL

By W. A. ALBRECHT¹

For the students of soils, it is fast becoming a scientific fact that the soil controls the body, and for them it is almost axiomatic to subscribe to the theme of the day which says "Our health depends upon the soil."

The calcium, or lime, for example, makes up 1.6 percent of normal body weight, yet appears in the available form in the soil to but 0.2 percent, though much more in total. Phosphorus, the companion element for bone construction, is in the soil usually in available form to an extent of less than 0.01 percent, an exceedingly small part of a total that in itself is of no great amount. In the soil's capacity to provide these two nutrient elements liberally lies the solution to many problems in plant, animal, and human nutrition. As the lime and the phosphorus are stintingly withheld or generously offered, there is exerted a quiet force that determines the ecological pattern for plants, for animals and for humans. In its quiet and subtle way, the supply of these two nutrients alone may nourish life forms into dominance, or may reduce them to annihilation. They are the first two nutrients in importance in terms of common deficiencies.

Ten elements for plants, and twelve of them for animals, or three times the number of those of air and water origin, are drawn from the soil. The small quantity of each of them does not reduce the essentiality. Life is impossible with any one absent. It is thus in terms of absolute supply of body-building nutrients that the soil controls and directs the pattern of life. It limits life, at least, to those forms and numbers that can be maintained by the nutrient supply delivered by the soil.

We have moved plants from place to place according to the weather rather than according to the plants' requirements of nutrition. Further, when one agricultural plant variety no longer is highly productive, we search and supplant it with another only to boast of our success in production of tonnage of herbage. But we forget that when the first variety failed because of the declining store of soil nutrients, then the second or introduced variety that succeeds must be producing tonnage by taking relatively less from the soil. It must be making itself by taking more from

air, water and sunshine, or what is above the soil. Its service to animals must then be one of providing packing for empty paunches more than of supplying soil-contributed nutrients required for animal body construction.

Short grass highly concentrated of minerals and therefore rich in body-building capacities, has given us animals well developed in both skeleton and flesh and of unusual abilities and endurance. Because of the nutrients in the soil beneath them, grass species selected so regularly by both wild and domestic animals in the West have been good feed.

Here in the vegetation in all its varieties are the colors and the forms by which the Creator has painted the picture of the nutrient qualities of the soil. On that canvas is laid out the pattern by which the higher life forms dependent upon vegetation can guide their own distribution if they are to live healthily on the land.

The clay and humus are the seats of activity in exchanging nutrients. They are the jobbers and it is on them in root contact that the plant must depend for its nutrient store during the growing season. More humus and more clay, then, mean more nutrients and more rapid crop growth, provided these exchangers are not overstocked with hydrogen, or acidity, the only item the plant can offer in exchange if it is to do any "growing" business.

Any form of life in its restricted locality is a reflection of the nutrient quality of the soil. Conservation of life then depends on the conservation of the nutrient quality, or the fertility of the soil. Conservation encourages our optimism as we understand the first source of the natural processes on which life depends and can thereby cooperate in, rather than hinder, the creation of more life and higher life. With Hamlet, we may not only note that the times are out of joint, but with him we may also agree with our responsibility in being "born to set them aright."

¹ Chairman, Department of Soils, University of Missouri. These excerpts are from an address delivered at the Conservation Laboratory, June 27.

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tion that each of us must make if we are to have victory. Every one of us, business man, professional man, laborer, farmer or housewife, must know that business as usual stopped when we went into the war. Each of us, you and I, ought to be reducing all non-essential purchases and buying as wisely as we can to keep prices from skyrocketing.

America must wake up and learn to buy wisely of those things nearest and cheapest. An adequate diet is not so much a matter of income as it is of wise buying, proper preservation and proper cooking. It is entirely essential and patriotic to take an invoice of ourselves; to see, first, that our job is essen-

tial to the Nation at war and is not a burden of luxury upon our people; second, that we have the health which gives us the strength and the spontaneity to do our job accurately and well. Third, that we have the optimum, robust health to keep us from breeding and spreading epidemics of diseases. Fourth, that as trained persons, to whom the majority of the people must look for guidance, we practice what we preach in health and diet. Fifth, that we put every ounce of energy we have into the job before us of arousing the people of this Nation to the necessity of everyone's getting this robust buoyant health at once and all of us giving all that a healthy body can give to our country.

REBUILDING AGRICULTURAL LANDS

Under the impact of war Ohio farmers have plowed up additional sod areas for the production of grain crops.

This has in some instances probably further increased the labor requirement and cost of producing livestock products.

This increase in grain in proportion to hay and pasture will bring about further depletion in the productivity of our soils.

This reduction of forage crop acreage is compelling the harvesting for hay, or utilization as pasture forage of crop acreages that might otherwise be used for seed production, and as a result forage crop seeds are apt to be far below requirements for seeding meadows and pastures.

We recognize that with the war emergency, commercial nitrogen is being withdrawn from general agricultural use and that the only substitute is better sods with more legumes in hay and pasture, and that sufficient legume and grass seeds for this purpose are not available. Our seed situation is made worse by our efforts to supply forage crop seeds to our allies at war and the need for seeding vast areas in airports, munition plants, and other war-material plants.

While for many years the quality or quantity of our hay and pasture have not been adequate for our livestock, neither have they been adequate for the maintenance of our soil productivity. Today the situation is more acute and more dangerous.

The only solution, it appears, lies in the rebuilding of Ohio's agricultural lands. How is this to be done? First, by appropriate land use; that is, let each acre be used in that manner in which it can be conserved and contribute most to our joint welfare. Let forest land be occupied by forest, permanent sod land by permanent sods and rotation crop lands by rotation crops. Second, by affecting a balance on our rotation crop land between our soil-building and soil-depleting crops; and third, by improvement of hay and pasture lands through better soil treatment, better seedings and better management.—D. R. Dodd, professor of agronomy, Ohio State University, and associate agronomist, Ohio Agricultural Experiment Station, at the Conservation Laboratory nutrition conference, June 1942.

A REPORT ON A FRIENDLY MEETING IN MISSOURI

BY RUSSELL LORD¹

Societies, like human beings, tend to stiffen as they age. Informal parley takes on the more pretentious tone of a "conference." Meetings become "conventions" and conventional.

Perhaps it is only because we, as a society, are still so young—only 3 years old last March; nevertheless, it is pleasant to report that Friends of the Land had fewer set papers read at them during their third annual meeting at St. Louis than were read, even, at their organization meeting in Washington in 1940.

Dr. Rex Tugwell and Dr. J. Russell Smith, were as I recall it, the only two who read papers at our first meeting and both of these were 3-minute papers, little masterpieces. At our second annual meeting, held in and out from Columbus, Ohio, in July 1941, Stuart Chase read a paper so well you hardly knew he was reading it and one eminent personage, unaware of the unwritten law of our order, pulled from his pocket a bale of manuscript and started to mumble and peer over it in the conventional way. But the sigh of pain which reached him in greater and greater volume from a polite but judicious audience as he proceeded led this learned fellow soon to prove that he was not only learned but smart. He discarded his ghosted manuscript, lifted his head and talked like a man. So the score at Columbus came to one and a half papers for a 3-day session, quite a bit under par for the course.

The score at St. Louis, during our 3-day annual meeting, July 23, 24, and 25, was perfect. Not a single written paper was read from the rostrum or the floor. "Our schedule of talks and events," the printed program announced, "is in its very nature elastic and amendable. It is arranged around informal panels, led mainly by men and women who have lately come to take an active part in our programs," in the hope that they "will bring new blood and new brains into the discussion and lead to widened plans of action * * * Discussion leaders will make their own rules but keep them as few and as flexible as possible. The idea of the first day's sessions is simply to open the subjects, and let the talk take its own course freely on subsequent days."

Hugh H. Bennett, Chief of the Soil Conservation Service, spoke at the opening luncheon on Thursday, July 23. He had just come back from Mexico. Speaking from the bottom of his heart, he developed the theme of soil as common denominator in con-

tinental and ultimately in world relationships. The Chief, as readers of this *Soil Conservation* will know, has been doing a great deal of thinking on this subject, especially since he helped set up an S. C. S. in Venezuela. Each public address he has made since has brought the idea of international soil relationships closer to the ground, yet stretched it further. The stenotyped report of what was said at St. Louis is not yet available. But when it is transcribed and published I think what Hugh Bennett said will stand as a major contribution to realistic yet prophetic thinking in these stormy times. He set the keynote of the entire meeting.

Without removing from the same large hotel room where lunch was served we went over into discussion, panel-led, but with much or most of the talk from the floor that Thursday afternoon. Louis Bromfield led the first exchange of views: "Soil, Rain, and Man: A Discussion of Eternal Relationships in War and Peace." Another Ohioan on the panel was George Chandler, president of the Ohio Chamber of Commerce. He said that he had never known that bad farming hurt industry by way of a wounded water supply, directly, until "somebody who was up to something put me in the same car with this Chief of yours, Hugh Bennett, at Friends of the Land's summer tour of Ohio, a year ago." The third man on the panel was Donald Wright, Editor of the riverman's *Waterways Journal*, St. Louis. He told what bad farming had done to the bed of the Mississippi and to St. Louis, at one time a considerable inland port.

Toward 4 in the afternoon a standing recess, and then a change, or extension, of subject, with a new panel, led by Dr. W. A. Albrecht of the University of Missouri. The subject was "Hidden Hunger: Erosion and Malnutrition in War and Peace." You will find elsewhere in this issue some reference to Dr. Albrecht's findings, as he laid them before a soil and nutrition seminar held in June at Tar Hollow Camp, Ohio. You will find mention also of confirming evidence brought in by Dr. Jonathan Forman, a Columbus, Ohio, physician, who deals with intricate human patients, whereas Dr. Albrecht gathers evidence, mainly, from simpler living structures, plants, and cattle. Both these doctors were on our panel at St. Louis. So was Mrs. Luis J. Francke, conservation chairman of the Garden Clubs of America. This Friends of the Land movement is really spreading out.

¹ Editor, *The Land*.

Walter Rust, president of the Federal Land Bank of St. Louis, was toastmaster at the banquet that evening. He told no jokes but warmed and speeded the proceedings with brisk, intimate presentations. Gov. Clifford Townsend, Administrator of Conservation and Adjustment, United States Department of Agriculture, the principal speaker, bore down on a point which led the *St. Louis Globe-Democrat* to remark editorially next day: "One of America's casualties in the last World War was the land itself * * * The temptation to repeat our mistakes has arisen in this war. But American farmers need not ruin their land to meet the production quotas. On the contrary increased production and soil conservation go hand in hand. The methods used in soil building also increase the yield per acre. It is America's task to feed the world, both while the war lasts and in the period of readjustment after the war. To do this job we must conserve instead of squandering our land."

Governor Townsend had just passed the better part of a week out on the ground with S. C. S. people. He paid due tribute to the fundamental nature of their calling. Louis Bromfield closed the first day's sessions with a 10-minute talk that ignored all bureaucratic separations, and was magnificent: "I am not a scientist. I am only a farmer and writer who loves this country very dearly and who does not want to see it betrayed by its own people and despoiled. Industry is only about 150 years old in this country. Agriculture is eternal. We need a new type of pioneer, not to ruin the country, to restore it. I call on all men and women of goodwill to join this movement. It is later than we think."

Attendance the first day had run around a hundred, with people there from 15 States and from Canada. Seventy took the train to Mexico, Mo., the following Friday morning; and there were 52 cars, all full of people, on the 60-mile tour of Callaway County that Friday afternoon. The university people who arranged the tour took us first to grass rejuvenation demonstrations not far from the campus at Columbia, and then to the historic erosion-measurement plats established by Dean Miller and F. L. Duley in 1917. With the measurements established, the Miller-Duley plats are now being used to test various methods of restoring subsoil to productivity. Soil regeneration, which leads into livestock regeneration and from there into human regeneration, was the theme of the trip.

Callaway County was natural cattle country that got torn up by plows to the point of widespread ruin in the first World War. We saw farms and homes that one-crop wheat and corn culture had washed out to the point where the Government was

buying in for around \$5 an acre. And across the road we saw farms which, put under a rotation of grain and Korean lespedeza around 1935, with respect for the contours, and with a reasonable application of lime and phosphate, have come up in yield from 20 to 50 bushels of corn to the acre, and increased the carrying capacity of their pastures sevenfold.

The weather favored Friends of the Land on this inland wartime journey. The day was sparkling clear, warm but breezy, not too hot. It would be a dull soul indeed who could not see the beauty and feel the wonder of those fields, almost killed in one war by neglect and ignorance, coming back into strength so rapidly, right in the middle of World War II. It is untrue that democracies are sluggish and unteachable. Give them the facts and the proof and the people will act.

Back to St. Louis in their private, air-conditioned day coach Friends of the Land traveled, visiting around. It was the best session of the meeting. Our closing day's discussions, led by Dr. Charles E. Holzer, Chester C. Davis, and Harry Slattery, resumed an international bent. "Before you can be an internationalist," one of our wisest members, E. B. White, of Maine, has lately written, "you have first to be a naturalist and feel the land under you making the whole circle." A rather large thought in time of war, but we of this world have suffered perhaps enough from little thoughts and little thinking. We propose to examine this subject further, come October, in a series of meetings at Memphis, October 11 and 12; in the T. V. A. area, October 14 and 15; and at Louisville, Ky., October 17.

In science, taxonomic studies are important. We must know the names of things because they are the building blocks of our environment. But the meat of the matter lies in the relationships which exist between these things. There is a profound ecology between a limestone pebble and the size of a farmer's silo, and science does not become education until we see it. And, not only must the teacher see it, she must know how to make her pupils see it—that's where the teaching methods come in.—Arthur R. Harper, field naturalist, conservation education, State of Ohio Department of Education.

An air view of the La Crosse, Wisconsin, Soil Conservation Experiment Station, titled "Design for Living," won first place in the scenic class of the 1942 Inland Daily Press photograph contest. It was taken by a staff photographer of the La Crosse Tribune.



BOOK REVIEWS AND ABSTRACTS

by Phoebe O'Neill Faris

MINERALS, NUTRITION POPULARLY EXPLAINED. BY ZOLTON T. WIRTSCHAFTER, M. D., NEW YORK, 1942.

This is a good straight summary of the facts as they are known about this important subject. There is a growing emphasis upon the part that minerals play in human nutrition. The author shows the specific though varied function that the minerals have in human economy. Not only are the major elements discussed but the so-called trace elements are given adequate treatment. Good nutrition is the most needed thing in American life and it depends upon good food. The nutritious quality of foods, in turn, depends upon an adequate supply of the various minerals in the soils upon which the food is grown. So all of us who have any interest in soil conservation, the problems of nutrition, or human health need this volume in our libraries.

The author points out clearly that the vital functions of the human body depend upon the ingestion, utilization, and excretion of these various minerals. The amount of mineral in the natural foodstuffs is the prime factor in determining the amount ingested. The minerals of a diet cannot serve as an index for the adequacy of the mineral supply because such an index ignores the specific role of each individual mineral element. One mineral cannot therefore be substituted for another.

It therefore becomes of the greatest importance to the race as a whole and to each of us as an individual that the soil upon which our foodstuff is grown is not depleted of these vital elements. The great lesson of conservation which our people must learn is to return to the soil the minerals which they have borrowed.—Reviewed by Jonathan Forman, M. D.

TEAMWORK TO SAVE SOIL AND INCREASE PRODUCTION. By P. A. Waring, United States Department of Agriculture Miscellaneous Publication No. 486. Washington, D. C., July 1942.

A farmer writes a bulletin for the Soil Conservation Service—that is news. P. A. Waring, farmer, values his and his neighbors' soil conservation project enough to go to the trouble of telling the whole story for the benefit of many thousands of other farmers. This is not merely news; it is good news.

"Actually there were six of us," he writes, "and we all lived on farms which were drained by a small stream that has long been called Honey Hollow Creek. This creek starts up on the hill on Frank's land, crosses and drains Walter's farm and Forrest's farm and then flows through the valley where Charlie and Camilo and I live." It takes a farmer to describe a watershed.

Farm land and woods; 840 acres of eastern Pennsylvania land that had been in use for 200 years or more, rolling but not any of it steep; some gullies, and "thin spots where crops grew badly"; finally the choked creek flooding all the bottom land—exposed subsoil on Walter's farm and 18 inches of overlaid sediment on Mr. Waring's valley cornfield. There you have their little watershed as it was less than 2 years ago, similar to hundreds of other little watersheds fanning out toward big rivers all over our country.

The farmer at the bottom of the watershed—Mr. Waring—"yelled first"—and went out seeking "Government" advice. The Soil Conservation Service man told him about watersheds, that he had a watershed problem, and that the six farmers would have to work together, have some maps drawn, make some plans, if they wanted to solve it. Mr. Waring looked beyond his own farm boundaries; he began to think of the whole six farms as a unit. He lost no time in gathering in his neighbors, like sheep in the fold, for a meeting with the local Soil Conservation Service representative who had come to help them "think the problem through." It happened to be a day of heavy rain, "when Honey Hollow Creek was running high and muddy under the bridge."

What will it cost? Will it be too difficult? Will we lose crops while the plan is being put into effect? Will we have to have expensive new plowing and harvesting equipment? Does it take longer to plant in strips? Above all, what can we expect in the way of yields while we are establishing soil conservation farming on our watershed? These were but a few of the questions the six farmers wanted answered. They were told that the Government would help survey the watershed, draw up the plans and maps, and put in base lines for field boundary changes. They made a visit to a neighboring county where soil conservation had been going strong for about three years; they saw contour strip planting, sodways, broad terraces, and farmers using the same equipment they had always used. They saw that these farmers were making money and that they had their erosion problems in hand. When, back at home, they finally saw the map of their farms with the conservation plan for the whole watershed, then they realized that they must work out the problem together, all because of Honey Hollow Creek.

They got started, late in September. They put in some broad-base terraces, in a field that "curved and hogbacked at the end of a long slope." They sowed winter wheat, the best they could do at that season. Skeptical neighbors laughed when little washes showed on inadequately protected ground between the terraces, but when it rained the water soaked into the soil—did not trickle creekward, roll riverward, plunge seaward, taking the soil with it.

Spring came, the eagerly awaited time when contour plowing and planting could be started, with the watershed map and conservation plans as guides. At the end of June they climbed the hill for a look—"down the hillside and across Honey Hollow * * * curved strips of corn and oats all over our farms." It was real, no longer theoretical, a mere map on paper!

Summer progressed. At the top of the watershed, Frank harvested wheat and pulled out an old hedgerow—then came the "only other group of terraces in our watershed * * * in long curves across the whole area." In strip-planting, they "jumped" the hayfield, to save the hay for the present. "Some folks had told us you had to rip out and lose good crops when you changed from square to contour farming, but that does not seem to be true. At least, we have not lost any crops yet." Thus Mr. Waring takes care of one important query regarding establishment of a conservation farming system.

By autumn the six Honey Hollow watershed farmers had solved some of their harvesting problems, the "hard-corner-to-get-at" problem, the stripped field arrangement problem; they had made a start at working out the problem of Camilo, who rents his farm to a corn grower—corn, and then corn, and then corn again, year after year, because there are no hay-storage or livestock facilities on the place. Camilo's farm is their "bad dilemma," but they will solve it, we know, because they all want to solve it.

What about the winter? During the winter, the six farmers decided to study soils, to learn what kinds of soils they had on their watershed and how much topsoil remained to them after a century and a half—and more—of use without protective methods. They summoned their friend from the Soil Conservation Service, and before long they had a soils map of their own land—and knew the none too pleasant but extremely important facts about their topsoil.

And so the farmers of Honey Hollow Creek watershed arrived at the point of "land capability," as we term it: "What is a field capable of yielding?" in Mr. Waring's words. This part of Mr. Waring's story, involving improved rotations, a unique record system, and a visitor from the Audubon Society, is in itself a little masterpiece of farmer writing. Undoubtedly Honey Hollow Creek watershed will be sweetclover-scented next year. Undoubtedly, soil conservation methods and values are in for a strict accounting in this Bucks County, Pennsylvania, area—Soil Conservation Service people must not forget this, and our share of the responsibility.

Thirty-six fine large photographs illustrate this farmer's story of six farmers' soil conservation project. There is a full-page drawing of the watershed, showing Honey Hollow Creek, placement of the six farmsteads, roadways and even the covered bridge; and, of course the conservation plan, charting "* * * our farms * * *" as a piece belonging together" occupies a prominent place so that other farmers may understand why Mr. Waring said to Walter, when he saw it, "I guess we've got something here."

Postscript: Mr. Waring not only writes a bulletin for the Soil Conservation Service; he sends us greetings and up-to-date information on the success and progress of soil conservation work in Honey Hollow watershed. His latest letter, to Glenn K. Rule, Head of the Section of Education, Division of Information, Soil Conservation Service, is quoted below:

NEW HOPE, PA., August 9, 1942.

DEAR MR. RULE:

It is Sunday morning, the first chance I have had to answer your last letter. I am just in from my mid-morning chores and a thorough inspection of the farm after a terrific rain storm which has only now stopped. I wanted to see what held and what washed away and I can report with satisfaction that, though Honey Hollow Creek is running high and wide, the crop land is all in place, and as far as one can tell there has been no washing or gullying to speak of. The big bowl-like field on my neighbor, Charlie Wendig's farm, which formerly dumped tons of water and soil on my place, is only now sending a trickle down the sod-way I keep for emergencies.

I thought you might be interested in getting a first hand report from Honey Hollow on the way things are behaving in times of flood. Coming 18 months after the bulletin was written it might tend to show the permanence of some of the things described.

* * * I am happy that the book is out and in use, and I hope you will tell me what kind of reaction it gets from farmers. If it bears some results in bringing more conservation and more permanent agriculture to American farm land I will be very happy indeed. It is only a small part of a

big effort, but I hope it will play its part well * * * The farmers on our watershed and others in this neighborhood have asked for copies of the bulletin. Moreover, we are in the midst of a district movement in Bucks County.

Greetings to you from Honey Hollow.

Sincerely,

P. A. WARING.

INTRODUCCIÓN AL ESTUDIO DE LOS SUELOS.

By Alfonso Gonzalez Gallardo. Published by the Mexican National Bank of Agricultural Credit, Mexico, D. F., 1941.

Agriculture throughout the Americas is alive to its new responsibilities. It must feed a world at war, and yet be ready to face a period of serious economic readjustment when peace is again restored. How Mexico is preparing to meet this challenge is excellently demonstrated by the recent publication of "Introducción al Estudio de los Suelos" by Alfonso Gonzalez Gallardo, Under Secretary of Agriculture for the Republic of Mexico. For the Mexicans the volume is a manual for both soil classification and efficient land use planning; other Spanish-speaking Americans will find in it an answer to the long-felt need for a Spanish text on modern soil science; but to us in the United States it is evidence that Mexico has passed another milestone in its agricultural and scientific history.

In the first part of the volume, the formation of soil, its physical and chemical properties, and the nature and circulation of water within the soil are comprehensively discussed. The section on climate that follows serves two purposes. It provides a guide for adaptation of crop production to climatic conditions and a background for the subsequent discussion of the great soil groups of the world, in which Gonzalez emphasizes the soil types of Mexico and the associated soil-forming processes such as laterization, calcification, and the formation of solonetz and soloth. In these discussions the author lays no claim to originality but, in a simple and authoritative manner, analyzes and interprets the work of the outstanding European and American soil scientists in terms of its application to Mexican conditions.

The treatise on soil science, however, is presented not as an end in itself but as a tool essential to Mexican agrologists and agronomists, particularly those working on irrigation projects. The same principle is applied in the discussion on climate. For the use of their agricultural program, the Mexicans have adopted the Thornthwaite system of climatic classification with slight modifications introduced to facilitate the correlation of climate with the distribution of soil types and crop production.

Thornthwaite's climatic types are divided into subclasses with more restricted ranges of temperature and rainfall, and the seasonal rainfall factor is readjusted to correspond with tropical and subtropical growing seasons. These modifications, which demonstrate the flexibility of the Thornthwaite system, were introduced by the eminent Mexican climatologist, Alfonso Contreras Arias, and their practical value is well demonstrated in his recent study entitled "El Trigo en Mexico" (Mexico, D. F., 1941). The close correspondence between the climatic and soils maps of Mexico is also worthy of note. With Contreras' research as a background, Gonzalez presents the Mexican climatic classification in complete form and in a manner simple enough to be understood and used by agricultural workers without intensive training in meteorology.

From the standpoint of the Mexican agricultural program

the concluding third of Gonzalez's work is most significant. It provides a manual of instruction for those men who are actively engaged in the work of planning the most efficient use of the land. The instructions given for preparing soils maps and surveys are chiefly an adaptation to Mexican conditions of the principles set forth in Kellogg's "Soil Survey Manual" (U. S. Department of Agriculture Miscellaneous Publication No. 274, 1937). Accompanying each soils map is a regional report, described by Gonzalez as a "mental photograph of the area as a whole," which includes physical and climatic factors, the agricultural and industrial development of the area, transportation, markets for local produce, and the social and economic conditions of the people. Together these form a background for detailed maps of land-use capabilities—the Mexican equivalents of the land-use surveys of the Soil Conservation Service.

The criterion used for the Mexican land-use survey is a modification of the system developed by R. Earl Storie (An Index for Rating the Agricultural Value of Soils, California Agricultural Experiment Station Bulletin No. 556, 1933, Revised 1937). Like Storie, Gonzalez has limited his work to irrigated lands, since they represent the greatest source of agricultural wealth in Mexico. Both authors estimate the value of land on the basis of three factors, each of which is rated on a decimal basis. The final land evaluation is the product of these factors, and consequently may be dominated by a major deficiency in any one of the three factors considered. The chief difference lies in the fact that Storie is interested primarily in soil, and Gonzalez in land. This shift of emphasis is accomplished by the inclusion of additional factors by Gonzalez and by the readjustment of the relative importance of others.

The final evaluation is expressed by numbers ranging

from 1 to 100. "First class" land has a rating of 70 or above, and is potentially capable of producing all of the major crops of the climatic region within which it is located. "Second class" land, rating between 40 and 69, can produce much the same range of crops, provided measures for maintaining or improving the quality of the soil are employed. On "third class" lands, with a rating of 20 to 39, the deficiencies are more accentuated, the range of crops is restricted, and continuous cultivation can be maintained only at considerable expense of money or labor. "Fourth class" land, rated from 10 to 19, is adapted to pastures rather than crop production. If the rating is lower than 10, land is classed a nonagricultural.

To date only a comparatively small portion of the agricultural land of Mexico has been adequately classified. The task remaining is enormous, yet the current world situation demands rapid progress and thorough work. The services of experienced agronomists must be used with greatest efficiency and new men must be trained to assist in this vital task. Gonzalez's work is designed for the use of both groups of agricultural workers. For every phase of their work, detailed instructions are given. The experienced worker is told how to use his time efficiently, and what should be his daily accomplishment. For new workers the most minute details are included. All are urged to make their reports comprehensive and complete, but concise, avoiding unnecessary repetition and display of erudition. Words should never be used where facts are better shown by graphs or tables. As a final admonition, Gonzalez adds, "If possible, make the report pleasant to read." In all of these respects, Gonzalez himself has set a high standard of writing for those who work under him in the Mexican Department of Agriculture.—Reviewed by Lois Olson.

Observations regarding animal health, particularly among grazing animals, have led to studies of crops and soils which have resulted in discoveries of deficiencies previously unrecognized. Properly planned animal experiments with crops of known history, accompanied by detailed chemical study of the crops with respect to the nutrients required by animals, should prove very useful in evaluating soils. In undertaking such experiments, however, it must be realized that animal performance is subject to as many variables as is soil fertility, and that these variables must be taken into account in planning the experiment and in interpreting the results. There are differences in the nutritive value of rations which are not measurable in terms of growth performance but which require refined physical, biochemical, and histological techniques. Two crops may vary widely in the content of a given nutrient and yet the differences may not be evident unless the crops are fed at restricted levels of intake in rations otherwise adequate in all respects. Without control of the variables involved in animal experimentation, differences in results may be incorrectly attributed to

certain soil and plant differences known to exist. For example, marked changes in growth performance may result merely from differences in palatability or from the general unsuitability of the rations for the species in question.

Animal experiments are essential for the evaluation of certain nutritive differences such as those based upon variations in the amino acid make-up of proteins and upon vitamin differences not susceptible to determination by chemical or microbiological methods. They are useful in searching for undiscovered differences in nutritive value and undiscovered nutritive needs. They also must be the final test of the differences in nutritive value which are measured by chemical or other means.

It is clear, therefore, that we have a great many complicating factors and a great many interrelationships that must be accounted for, one by one as we attempt the task of properly evaluating "the soils that support us."—Kenneth C. Beeson, chemist, United States Plant, Soil and Nutrition Laboratory, Bureau of Plant Industry, United States Department of Agriculture, Ithaca, N. Y.

For REFERENCE

Compiled by **ETTA G. ROGERS**, Publications Unit



Field offices should submit requests on Form SCS-37, in accordance with the instructions on the reverse side of the form. Others should address the office of issue.

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¹ Prepared solely for official use by the Soil Conservation Service.

² From Superintendent of Documents, U. S. Government Printing Office, Washington, D. C.



Left to Right: Claude R. Wickard, Secretary of Agriculture, United States; Pamanes Escobedo, House of Representatives, Mexico; President Avila Camacho, at the microphone; Marte R. Gomez, Secretary of Agriculture, Mexico.

**PRESIDENT CAMACHO OPENS THE
INTER-AMERICAN CONFERENCE ON AGRICULTURE
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SOIL CONSERVATION

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Smokes for soldiers and the rest of us...medicines and insecticides...startling new developments in tobacco growing under erosion control, in an interesting article by Phoebe O'Neill Faris. Also within, are pointed papers by H. H. Bennett and J. E. Church.

UNITED STATES DEPARTMENT OF AGRICULTURE - WASHINGTON

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WELLINGTON BRINK
EDITOR

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SOIL CONSERVATION

CLAUDE R. WICKARD
SECRETARY OF AGRICULTURE

HUGH H. BENNETT
CHIEF, SOIL CONSERVATION SERVICE



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It has been said that wit was born into the Old World with the first tobacco pipe. Certain it is that there is nothing funnier in post-Sir Walter Raleigh literature than the poetic dreams and prosy fantasies of Old World antiquarians who tried vainly to prove that the "weed" was known to ancients many centuries before "that first week of November 1492," when "Europeans first noted the American Indian custom of tobacco-smoking." One Turkish traveler even claimed to have found a tobacco-pipe imbedded in the wall of an edifice constructed before the birth of Mahomet; and, to make assurance doubly sure he declared that it still retained the smell of tobacco-smoke. An Irishman found a short pipe sticking in the mouth of the skull of an ancient Milesian "at Bannockstown in Kildare"—and at once there appeared a learned paper parading the relic as proof of the use of tobacco in Ireland ages before America thrust its giant head above the horizon far in the western ocean. Were they envious of the new continent and its "philosophick weed"? Or, was it but a gangling phase of the new wit, born of smoke-rings from Old World pipes packed with tobacco grown in Maryland and Virginia?

There is an herbe which is grown apart by itselfe

By Phoebe O'Neill Faris

Only the Indians of the Americas can be called the ancient users of tobacco. The Mound Builders smoked it, in porphyry pipes of ingenious fabrication. The aborigines of Yucatan considered tobacco sacred. The Brazilian Indians were the "fathers of snuff." The Red Men of the West Indies "disgusted" Columbus by everlastingly snorting through their forked pipes.

Without doubt, tobacco is truly an American weed, and in view of the tremendous amount of literature on how the Indians used the plant it is amazing that there is so scant an indication as to how they grew it. Some three and a half centuries ago a Governor of Virginia wrote thus in his Briefe and True Report: "There is an herbe which is sowed apart

by itselfe, and is called by the inhabitants *uppówoc*. In the West Indies it hath divers names . . . the Spaniards generally call it *Tobacco*." Apparently the North American Indians did have special cultural methods for their *uppówoc* which in their native friendliness they passed on to the colonists.

It may be that the Indians knew that much of the soil of what for long now has been Southern Maryland was adapted by nature to the growing of tobacco. But, more than likely, then, even as now, the Red Men did not tell all they knew. Slowly retreating westward, they left it to the English settlers to do the hard work of hacking away the forest to expose the mellow, friable soils, so easy to till, and



1:15 p. m.



1:50 p. m.



2:10 p. m.



2:45 p. m.

Water under control. This series of photographs was taken during an hour and a half of rainfall at the SCS hill-culture tobacco tract, Beltsville, Md. The young plants are in ridged rows on a 1-percent grade.

start, in the middle of the 1600's, a new husbandry dedicated to a human foible, yet destined to become an economic giant reaching



This Maryland tobacco farm was planted up-and-down hill, the old way, the wrong way. The usual heavy summer rains came as the crop approached maturity—a ruined field, a poor crop, wasted labor.

into every chink and cranny of the world—and destined likewise to play a slow and sure havoc with the soils of a certain coastal area called in great days the Tidewater.

There isn't any doubt, in this year of world war, that the Indians started something when they taught white men to use their weed. Today, in spite of its paradoxical history, tobacco, although not a food crop, is a "must" crop, all bound up with our intricate economic system and our war effort—the soldier, just out of battle, asks for a "smoke"—and providing livelihood for millions of our people in various areas throughout our country. Southern Maryland is one of these areas.

Some recent writers and others not so recent have maintained that the day of tobacco is past and gone in the Maryland Tidewater—that the soils are "tobaccoed out." On the contrary, it looks today as though those writers, recent and not so recent, reckoned what they knew not of; they reckoned without the new pattern of farming, no matter what the crop, and a certain group of men who believe in experimenting to the point of certitude and then demonstrating to farmers conclusively that there is a right way to farm. These men know that the most seriously eroded and depleted soils in Mary-

land are those soils that have been used longest and hardest for tobacco. They are nevertheless convinced that the more than half-a-million acres of "natural" cigarette tobacco soils of Southern Maryland can be improved to the point of "excellent" tobacco soils, and kept that way even while tobacco production is maintained to meet demand.

They look at it this way: There is very little demand for poorer tobacco grades and therefore only land suitable for production of high quality tobacco should be used for growing tobacco. Such land must have all possible soil conservation and at the same time the "temperament" of the tobacco plant itself must be so thoroughly understood that correct soil conserving and soil improving culture will be "normal" culture. They are determining, by experiment, the ways and means, the methods and the fine points, for maintaining high-grade cigarette tobacco production on the Sassafras-Collington soils of the Southern Maryland area, without further soil erosion and with good yields. Their real heart-and-soul objective, one suspects, is permanent security for the tobacco farm people who for generations now have been sending much expensive fertilizer downstream, along with their priceless topsoil, to clog the little river

ports with shifting shoals and reefs. After all, Southern Maryland's principal cash crop is still tobacco.

People working together toward the same end—that is co-operation; and that is what is going on out in Maryland for the benefit of tobacco growers. As a matter of fact, these experimenters are cooperating so closely and are so interested each in the other's plats, fields, plans, and findings that it isn't easy to put your finger on one as a Government man, another as a State man, a county man, a district man, and so on. They are, however, representative of several great institutions:

Dr. Garner, in charge of the Division of Tobacco Investigations, Bureau of Plant Industry, keeps a watchful eye over all, for coordination of ideas and results. Dr. J. E. McMurtrey is senior physiologist of the same division, and is famous for his studies and writings on deficiency symptoms of tobacco—he can look at a speck on a leaf and tell you what "essential" that plant lacks. W. B. Posey, Specialist in Tobacco for the University of Maryland, is primary adviser on how to grow tobacco in the field and what to do with it after you have grown it—he is well known to Maryland farmers, was born in Southern Maryland and there isn't a weed or a hornet in the Tidewater that can escape him. C. S. Britt, associate soil conservationist of Soil Conservation Service's Hillculture Division is all wrapped up in devising best methods of growing good tobacco on Maryland's slopes without further loss of Maryland's soils. He does not scorn picking off big green worms that may have invaded his plats—he snips off their heads with the greatest of ease. D. E. Brown is superintendent of the tobacco ex-

perimental center near Marlboro and to him tobacco is still the "gold of the Province." There are others whom I did not see on a certain sparkling summer day—E. M. Davis, our Service's State conservationist for Maryland; and M. B. Fussell, district conservationist located at the Marlboro office. These two no doubt were all over several counties that day—more than 5 inches of heavy rain had pounded the area the preceding 48 hours and soil conservationists like to get out on the ground at such times.

Some of the things these men have learned about the Indian "weed" certainly would have amazed the Indians, not to mention the poor man of England of the 1600's who had his first puff of its aroma through a walnut shell and a straw. Other American weeds are very much in the picture these days out in Maryland's cigarette tobacco area, and this is most encouraging news to soil conservationists because weed cover controls erosion just as does any other plant cover. When the weeds are good for both soil and crop, with a substantial advantage to the farmer's income, then you have something.

For upward of 30 years plant scientists have been making intensive studies at the Maryland tobacco experiment station, at Marlboro, to determine practical methods that can be used by Maryland farmers to produce good yields of high quality tobacco on their Sassafras-Collington soils. Fertilizers and manures alone did not do the trick, and certainly did nothing in the way of holding the soils in place. Everybody knew that newly cleared forested areas produced the finest tobacco yields—but that was impractical, to say the least, because all the forested areas had been cleared. Nor can many farmers anywhere

afford to let their tobacco lands lie idle for long years while even a scrub forest takes its leisurely time about growing; a farmer can go on the rocks this way just as certainly as he can if he goes on setting out tobacco plants, year after year, in soil that is completely exhausted of the plant nutrients essential to his crop.

Tobacco farming in Southern Maryland must have looked rather hopeless at the beginning of the century, but not so today. Twenty years of experiments ought to mean something, and it is just that long since W. M. Lunn and Mr. Brown of the Bureau of Plant Industry started tests with tobacco grown after natural weed fallow at the tobacco field station at Upper Marlboro where the land is level and the soil Collington fine sandy loam. Although Mr. Lunn died in 1939 the experiments still go on, and it is now apparent that unparalleled success can be obtained by allowing the land to revert to a natural weed cover following a crop of tobacco and then planting more tobacco. "Resting" the land through one growing season, under weed cover, served over a period of 13 years to increase the value of the succeeding tobacco crop \$160 per acre above tobacco grown after bare fallow. Two or more seasons under weeds gave still greater returns—\$34 per acre more. Thus we have a rotation system definitely planned to include weeds.

What is more, it is an established fact now that the common ragweed, found anywhere from the Atlantic to the Mississippi River, is a primary benefactor of the tobacco crop, though many other annual weeds including the legumes, wild pea, partridge pea, and rabbitfoot clover play a part. Here, then, is the latest paradox regarding the Indian's paradoxical weed, tobacco: Ragweed grows

good tobacco; hay fever victims get hay fever from ragweed; most hay fever victims use tobacco . . .

With the patience characteristic of the true scientist, these Maryland experimenters grew a great variety of local weeds in pure cultures, plowed them under and grew tobacco, checked and double checked, using dollars and cents values as criteria. They have learned to know the weeds as "best" weeds, "good" weeds, and "bad" weeds—for tobacco. The ragweeds and horseweeds are bests, while the lambsquarters and lespedezas are bads. The ragweed comes in first, by order of Mother Nature apparently; the biennial horseweed invades by wind-blown seeds the second season, by a like command; and if the land is rested for three or more years weeds of the perennial growth type such as broomsedge, goldenrod and aster become increasingly prominent in the weed population.

The tobacco farmer, however, does not need to be concerned with weeds in pure cultures, except during the tobacco year of the rotation when he will want a good, clean, and "pure" stand of the great American Indian weed, tobacco. He will need to have only weeds in abundance, for plowing under in the spring, to prepare the land for a bumper crop of tobacco. Incidentally, plowing under in the spring seems to be \$84 better than plowing under in the fall. And, again, this is good news for soil conservationists. Keep the soil covered—some say it is getting to be an obsession with us—but you never know when the sky is going to open to let out a flash flood.

What about land that still is cropped to tobacco year after year? The tobacco specialist at the University of Maryland.

W. B. Posey, has developed with more than a little success a winter cover of wheat and hairy vetch for use on such land. Farmers who have limited acreages of Collington or Sassafras soils have used this practice on relatively flat land for as long as ten years and are still producing good tobacco crops. The land is seeded to the wheat-vetch mixture as soon as the tobacco is harvested; the seeds germinate quickly and with favorable weather a good protective ground cover develops before winter freezes begin.

Under this system the ground is bare of any cover except tobacco—which definitely is not a soil-erosion control crop—for about one-half of the total rotation period of 12 months. Under the 2-year tobacco-weed rotation the soil is bare of any cover except tobacco for approximately 12 out of 24 months. The proportion is the same. Then why not combine the seeding of vetch and wheat with the weed cover period and reduce by about one-half the unprotected period in the tobacco-weed rotation? They tried this out at the Marlboro station and proved that it can be done without interfering with the efficiency of the weed cover.

That the tobacco growth period still is the weak link in the system is best realized by the soil conservationist. He knows how much good soil goes down the river never to return, especially if the unprotected soil is on sloping land. In Maryland, "natural" tobacco soil does occur frequently on hillsides. Thus when the Soil Conservation Service hill-culture work started at the Beltsville Research Center in Maryland the problem was how to grow tobacco on sloping land and at the same time keep the soil in place and conserve the soil fertility and the water. Cooperating

with the Maryland Experiment Station and the tobacco experimental farm at Marlboro, Soil Conservation Service men planted two hilly fields to tobacco—one with up-and-down hill rows, the other with strongly ridged rows laid out across the slope. Rains came. During a single thunder storm yielding a 3-inch rainfall, upward of 70 tons per acre of topsoil was dislodged and washed away from the field with up-and-down hill rows. The contoured field with ridged rows lost practically no soil. This technique for controlling erosion has not only held the soil in place but has yielded an average return in tobacco value that is \$50 to \$75 greater than the like areas that had no such protective treatments.

The row structure is interesting. A middlebuster is used to throw up ridges approximately 10 inches high to receive the young tobacco plants. This provides aeration and prevents wilting from water logging. The trenches between ridges perform two useful purposes—they catch rainfall and allow it to sink slowly into the ground for the benefit of the crop, or in case of heavy rains they carry excess water around the slope to the grassed waterways. Of course the contour row gradient is extremely important:

With ridged row structure, exact contour and 1-percent row grade has been superior to steeper row grades. Obviously, the strongly ridged row is to be used only with cultivation across the slope.

There appears to be no practical reason why the contour ridged row system of cultivation would be any more expensive to carry out on the tobacco farm than the old flat up-and-down hill method, even though some of the land area must be used for grassed drainage channels. The extra return from the crop is money in the pocket, and at the same time the soil is kept on the field so that its fertility can be built up for even greater future returns. Tests are now being made at the Beltsville station to determine the value of straw mulching in the tobacco culture system.

An old writer, famed for his subtle wit, set down for all the world to see these words: "Eating tobacco is essentially an American custom, and was no doubt derived from the example of the worm that lives upon the growing plant." Well, we do not eat it; but we do raise it on millions of acres of our land. Let us learn then to do the job the right way—for the sake of our soils.



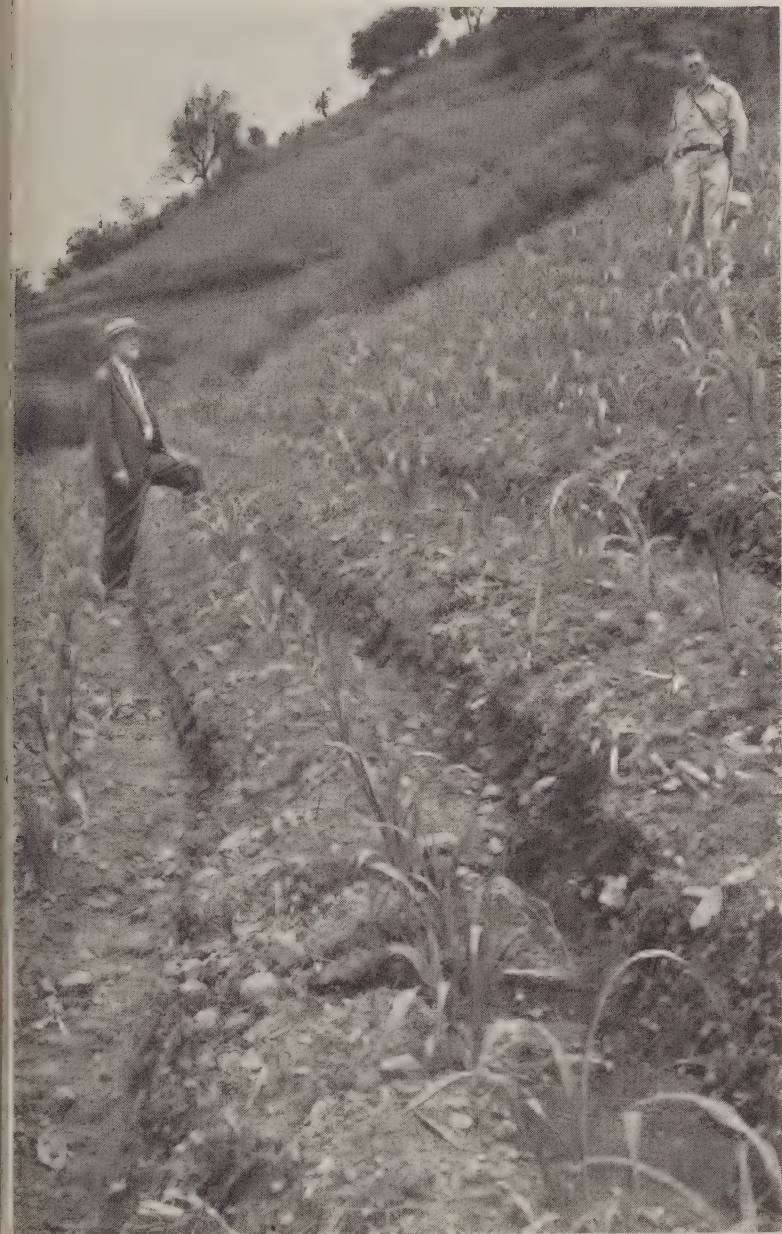
Left.—Natural weed fallow. Right.—Tobacco following weed fallow. (Marlboro, Md., Tobacco Experiment Station.)

Some Glimpses of Rural Mexico

By H. H. Bennett, Chief, Soil Conservation Service

To Tenancingo

The work of Section II (Agrology), Second Inter-American Conference on Agriculture¹ completed, several of us joined a number of technicians from the Mexican Department of Agriculture on a trip to the Tenancingo country, some 50 miles southwest of Mexico City. It was a typical July morning on the high-plateau, delightfully springlike.



Corn on terraced slope above Tenancingo, Mexico; a furrow break in the foreground. H. H. Bennett faces up the hill toward Ing. Lorenzo R. Patiño.

One of the most interesting parts of the trip was the reforestation done by the Government of Mexico just outside the city, on the paved highway to Toluca. Here, over a large area, the plateau which rises gradually toward the west has been deeply incised by a number of streams and streamlets heading in the locality and flowing easterly to the canals that lead the drainage of the city and its environs

off through the lower country northeast of the city. These headwater streams flow through deep trough with steep slopes that have suffered severely from sheet and gully erosion.

The plantings—mostly eucalyptus, ash, casurina, and cedar—were doing splendidly, especially considering the general unfavorableness of the land. I had seen these plantings two years before, when they were new, and was much surprised at the excellent growth already made. The trees are now beginning to lay down some forest litter—mostly leaves, but apparently enough to restrain erosion considerably.

We made several stops beyond the forestry project to examine interesting aspects of cornfields. Nearly everywhere about Mexico City we found corn to be of the same variety—a high-altitude type with hairy stems showing a bluish cast.

An interesting method of corn culture on slopes was seen in a number of fields along the Toluca Road, as well as in other localities. The furrows between the rows follow the contours fairly close and are shaped square by hand work to the approximate dimensions of 12 inches deep by 12 inches wide at the bottom. A farmer of the neighborhood explained that this kind of open furrow, in carrying off excess water, prevented the crop from turning yellow during the rainy season. It occurred to us that the furrow was quite capable of trapping a considerable amount of eroding topsoil and also of directing some of the “excess” rainfall into the reservoir of the soil for subsequent requirements.

In some fields haba beans (horse beans) are grown between the corn rows. This came about as near to being a rotation practice, with legume included, as was observed on the trip.

Finally, at still higher elevation, we passed through a belt of evergreen coniferous forest. Someone said this section of beautiful green forest and lush grass was known as the “Desert of the Lions.” When the question was raised as to what kind of lions, we were told there was not even one lion of any kind in all the locality.

“In that case, why mention lions?”

“Well, you see, it may have been that whoever named the place wished to emphasize the complete

¹ See the article on this conference by Edward H. Graham, in the October 1942 issue of *Soil Conservation*.



Pine forest near Rio Frio, east of Mexico City.

absence of lions by use of the word desert, which in Spanish sometimes means deserted. Anyway, the lions have departed, if they were ever here."

With all the dangerous lions thus readily disposed of—not excepting even so much as a southwestern mountain lion—we continued safely in the direction of Toluca still more or less convinced that those highlands were too verdant and refreshing to be referred to in any sense as desert or deserted.

Leaving Hidalgo National Park near the foot of the mountains, we crossed a brook of sparkling clear water that came dashing gaily out of high forest. This was where a new bridge and a stretch

of new road were being built. It was also near the fish hatchery, along the edge of the important corn-producing Lerma Valley, or Toluca Valley.

I somehow can't forget the name of the truck that led us in the procession of trucks, auto-busses, plain autos, and vehicles of lesser order that marched slowly over this section of the highway. The name was: "I don't stop long young lady." And recalling the name reminds me that in Mexico, as in Cuba and various other countries, practically everything that moves on one or more wheels has a name—often a beautiful name. And frequently, too, the animals all have their individual cognomens. In Cuba, for example, carts are often drawn by unexcitable oxen exquisitely named, and lustily called to by their drivers "Violet," "Butterfly," "Humming Bird," "Yellow Flower."

Well, why not? There really may be more in a name than Shakespeare was willing to concede. The Cuban oxen know their names perfectly, and they usually respond to any reasonable request or expletive the driver directs to them personally. And we name our pullman cars in the United States just as beautifully, and then promptly denote them by numbers.

At Toluca we had a second breakfast: a light one, you might call it for politeness, but good. The piece de resistance was scrambled eggs with sausage mixed in—a special Toluca brand of sausage that you should try next time you pass that way. It's really good. The coffee, too, I can recommend most heartily. Mexicans really know how to make it.

As we came out of the restaurant, four Indian women trotted by with huge cargoes of plants or herbs perfectly balanced on their heads. These stout women from the rural districts are said to travel long distances carrying heavy loads, always at a shuffling sort of gait—and with happy faces. They sometimes cover as much as 35 or 40 miles a day, with great loads on their heads and babies in their arms. The men, too, often carry unbelievable loads of lumber, pottery, baskets, chickens, and other articles of trade. There is doubtless malnutrition in some families, but seemingly not much of it where these stalwarts come from.

Going south from Toluca, we passed many other carriers of cargoes. Among them were fleets of donkeys, some laden with pulque, others with lumber, and still others with a variety of sacks, boxes, kegs, and great bundles containing things we knew not of.

Pulque is transported in goatskins. As time passes, gas often accumulates in these flexible containers in such manner as to straighten out the leg



No bridge. No ferry. But the highway finds a unique way to get past this stream that has taken to the air.

parts. The motion of the donkeys sets up a sort of flopping about of the liquid inside the skins, which, in turn, starts a jerking or waving motion of goat legs protruding outwardly that makes you wonder at first sight if it really is necessary to imbibe pulque in order to get the full effects.

And that was not the most astonishing thing about this goatskin method of transporting liquid refreshments. When a boy in charge of a battery of some 20 pulque-laden donkeys stopped near where we were looking at an extra good type of Lerma Valley soil, and let go of the pressure in the goat legs by untying a string along about the hoof joint, the gas thus released set up weird sounds of whistling and swishing like escaping steam. I think I must have pretty well forgotten about the soil we had been examining, as its profile characteristics are only dimly retained.

We entered Santiaguito not by crossing the Santiaguito River that flows by the city on the north side, but by going right on under it—I mean under the river. It seemed more like going through some sort of burrow than anything else—not at all the same simple thing as passing through a tunnel. What we drove through was a hole that had been projected beneath the elevated river bed so the road could get on its way into the city, there being no bridge or ferry for its convenience.

Santiaguito River obviously has been quite an active stream during its career on the great Mexican Plateau. During recent centuries it has gone diligently about the business of transporting huge quantities of soil out of the overgrazed mountains to the west, piling it up in the channelway and along the banks until the actual flow is today about 15 feet above the adjacent broad, flat plain of corn fields.



Looking upstream on a flying river south of Toluca.

By this process of self-elevation, the stream has moved up into the air to such extent we could not resist calling it a “flying river.” We saw similar streams in the Toluca Valley and the next day in the State of Tlaxcala.

South of Santiaguito we crossed the mountains by a delightfully cool pass, first through pine-oak forest and then through pine alone. On the way down the south slope into the valley of Tenancingo we crossed at several places the ancient cobble-paved Cortez highway, still in good condition but no longer used.

At the first commanding view of the hills and valleys about Tenancingo we were amazed at the great number of bench terraces spread out over the far-reaching landscape. It was an astonishing sight—a view depicting the earthy products of a prodigious expenditure of human labor.

At close range, some of the terraces were found to be flat-topped and in good state of preservation. All of these flat benches were in cultivation. Other terraces, on steeper slopes, supported by rock walls that usually were invisible because of a covering of accumulated erosion material washed from above, seemed rather too far apart for the declivity of the land. An additional wall between probably would

have made most of the terrace-interval flat or nearly so, and less subject to erosion.

We asked a farmer working in a cornfield if he would not stand by the lower side of the supporting wall immediately below, to show its height in a picture. He said, very politely but firmly: "No; it is absolutely impossible for me to allow my picture to be made in another man's field; here in my own field, however, you may take my picture as you please."

I failed to learn whether this farmer's decision had to do with pride in his own field, which was a nice looking field, or was merely a matter of hesitancy about taking liberties with another person's property.

Cultivation between the terraces is generally well done, on the contour, both with hand work and plowing. A recent very heavy rain had cut through several corn rows in one field we went into, but the farmer had promptly closed the incision with earth. In places erosion has overcome and ruined some of the steeper terrace intervals, especially where careless cultivation has been done or where the retaining walls have fallen and been allowed to remain unrepaired.

In general, however, it would be difficult for the walls to fall, since many of them are completely covered with soil and are thickly grown up with a small-fruited peach and other fruit trees and shrubs of good stabilizing value.

Who built these terraces, and when, we were unable to ascertain. True, there was little time for investigation, but the answers to what inquiries we made were on the order of *quien sabe*.

We saw little evidence that modern man is constructing any more of these worthy structures. They may have been established a hundred years ago, two hundred, three hundred, or longer—who knows? At any rate they represent a splendid achievement in the field of mechanical soil conservation—an outstandingly efficient method for holding soil up on the very same slopes where nature manufactured it.

Another question that got tangled in with our observation about physical land conditions in Mexico—and we did not find the answer—was: Why so many of these laboriously built conservation structures in some localities and no structures of any kind and no evidence of any other conservation effort in other localities not far away? Was it a



The terraces of Tenancingo.



Ruins of Hacienda del Moleno. This one-time magnificent structure, erected out of the wealth of the soil, has gone with the eroded land.

matter of local culture, of tribal enforcement, of the experience of some outstanding farmer?

Across the valley, in an easterly direction from the town of Tenancingo, we walked up a long slope practically all of which was cultivated or had been cultivated. For the most part, especially over the steeper upper half of the hillside, the land was not terraced, although at considerable intervals hillside ditches had been installed. Some of the cultivated upper slopes had a declivity of around 100 percent. Erosion was generally severe—so severe that some fields had lost all the topsoil down to tough, infertile clay that produces only 3 or 4 bushels of corn to the acre—or no corn at all. In still other places, now abandoned, even the subsoil was deeply gouged.

To Tlaxcala

It is an interesting trip to the ancient State of Tlaxcala. You cross the mountains east of Mexico City, enjoy splendid views of Popocateptl and Sleeping Lady (Ixtacihuatl), and pass through beautiful pine forest in the National Park along the crest of the range. The highway is good all the way—well paved, with easy grades.

Most of the forest has a dense ground cover of sacaton grass. There was not much evidence of fire damage, although 2 years previously I had seen smoke at a distance from several fires burning along

this range—probably small local fires. The pine trees (Montezuma and Ocote species) showed no evidence of charring.

Dropping down into the village of Rio Frio, we had another breakfast for the day (it isn't nearly so important a matter to record the precise number of breakfasts or other meals one eats on the Plateau of Mexico as it would be to miss anything so delicious as that morning's *tacos de carnitas*, served with *guacamole*.)

Beyond Rio Frio the country is generally smooth, with slopes not usually over 4 to 6 percent. Here is yellowish sandy loam soil overlying tepetate. Most of the land is cultivated, but erosion is fast becoming an important farm problem. Conservation work should be started here without delay; the land is not greatly different from that we saw a little later in the same day, where erosion has made thousands of acres permanently worthless by stripping off all the soil and all the subsoil down to the parent rock.

An occasional farmer in this moderately rolling section east of Rio Frio has installed a kind of hillside ditch to cope with runoff and help to curb erosion. Beyond this, very little is done in the way of control.

This section includes much land where terracing, contouring, and strip cropping probably could be installed easily and with good results.



The end of a once-productive field: soil and subsoil stripped to the bedrock. The pedestal in the background indicates the extent of erosion. Near Tlaxcala, State of Tlaxcala.

Near Santa Justina we saw a number of “flying rivers,” and a fair-sized area of bare alkali land on the broad-floored flat valley of one of the tributaries of Rio Atoyac. Much of the better land here is used for corn. Most of the crop is grown on small mounds—“hills”—built up with hand labor.

It was here that I first became acquainted with the Mexican custom of rural people having their homes in villages instead of out on their farms. Perhaps the differences between these two ways of living is not so great as might seem, so far as getting the farming job done is concerned.

But I did come suddenly to realize the very different appearance of things at about 12:30 p. m. At that time every farm worker—plowmen, and men and women with hand tools—who a little while before had been scattered at work all over the plain, quit their labors and set out for their home villages, some following the highway to the east, and others dispersing to the west. All through the more important agricultural sections of Mexico there are a great many villages, and you don't have to go far to get to one.

Later that day, after we reached the more seriously eroded lands, I tried to find the remains of former habitations. Failure to locate such ruins again focused my thoughts on the national differences in rural modes of living.

In the country around Mexico City many of the names are none too easy for outsiders. For example, when we went down to the sarape factory at Santa Ana Chiautempan, situated on the headwaters of Rio Atoyac, in Tlaxcala, we discovered that we were more or less surrounded by such communities as Apetatitlán, Cuahuixmatla, Tepatlachco, Tzompan-tepec, Yauhquemehcan, Tlahcuilohecan, Amaxac, and Huiloac.

But these things all work out very nicely. Within a few days one learns to pronounce more or less passably the name of one place, after which the problems of Aztec and Tlaxcalan spelling and pronunciation eventually work themselves out.

From Tlaxcala, in the State of Tlaxcala, whence came the Indians who aided Cortez in overthrowing Montezuma, we drove easterly beyond Ocotlan through the low country along the northerly foothills of Mount Malinzin.

It was here that we found so much of the very bad type of erosion. It reminded me of conditions we encountered in the Andes Mountains 6 months previously, where the effects of erosion were so terrible in some places that one of the conservation technicians got to turning over in his mind the possibility of inventing a special term for land that has been eroded to the finish.

These Tlaxcalan lands, too, have been stripped of

all their soil, right down to the hard skeleton of bedrock. And I doubt if much could be accomplished by any attempt at further detailed description of such gaunt, denuded areas. Certainly, they can't wash any more; they have passed from the agricultural status to that of mere geological materials.

I had seen many areas of such land before—in my own country and in other countries. And about the only thing I could say to my Mexican friends was that no agricultural country anywhere in the world could afford to postpone the vitally important matter of stopping abruptly the process of gradual soil impoverishment that leads ultimately to dead land, dead nations, and dead civilizations.

We tried to find out why some areas in close proximity to the devastated tracts had been saved by bench terracing mostly built with the aid of maguey plants grown in rows along the contour, while larger areas had been left entirely unprotected. It seemed to be the general opinion that a combination of things had taken part in the tragic downfall of probably more than 200,000 acres of formerly cultivated land in the State of Tlaxcala alone. Unfamiliarity with the deadly effects of erosion undoubtedly played an important role, and exploitive farming was another factor. People don't go out and deliberately destroy their farm lands. Such abuse as does occur develops from human weaknesses that are age-old and world-wide—the inclination to look upon pro-

ductive soil as little more than common dirt, not subject to change and valuable only for what it will produce at lowest cost.

We drove on as far as the ruins of the great building that formerly was headquarters of Hacienda del Moleno, situated near the banks of Rio del Moleno. This expansive structure, completely deserted and rapidly disintegrating, once enclosed a chapel, a mill, baths, and comfortable quarters for a large number of people. The wreckage of masonry stands as a dismal monument to the process that laid low the land—the land from which once came prosperity and well-being.

No people can afford to look complacently upon such overwhelming disaster as the decline and loss of its basic resource of productive soil.

Fortunately, Mexico has just recently set up a Soil Conservation Service under the direction of Ing. Sr. Lorenzo R. Patiño.

It was Director Patiño who took us out to see the severe erosion of Tlaxcala, which he says is destined to undermine and ruin the economic life of that State if it is not stopped very soon.

At the Second Inter-American Agricultural Conference one of the resolutions adopted had to do with soil and water conservation. This historic document (Resolution No. 30) was published in the October issue of SOIL CONSERVATION, translated from the Spanish.

The erosion of unprotected snow. Earliest use of Mount Rose snow sampler, on Mount Rose. The sampler is still primitive in length, strength, and efficiency.

The Central Snow Conference, at its December 1941 meeting at Michigan State College, signalized the maturity of snow surveying by giving the writer a citation of appreciation and confidence.

This citation was immediately "dedicated to the Nevada Agricultural Experiment Station and particularly to Director Samuel B. Doten, whose initiative made possible the inception and progress of the work." With them should be associated in memory President Joseph Edward Stubbs of the University of Nevada who believed farther than others saw; Paul M. Norboe, Chief Assistant State Engineer of California, who gave snow surveying continuing life in its darkest days; and Governor Emmet D. Boyle of Nevada, who created the first State cooperative snow surveys.

But associated with snow surveying, like atmosphere, are scores whose personalities are inseparable from the work. These, particularly Charles A. Mixer and Robert E. Horton, reach from the earliest



Organized Water

By J. E. Church¹

days and from the far places of the continent. To all of them the citation also belongs.

Although one-fourth to one-third of the land surface of the Earth has a seasonal snow cover,² the role of the snow in the annual water cycle was poorly comprehended at the beginning of the century, and its seasonal assets were almost wholly

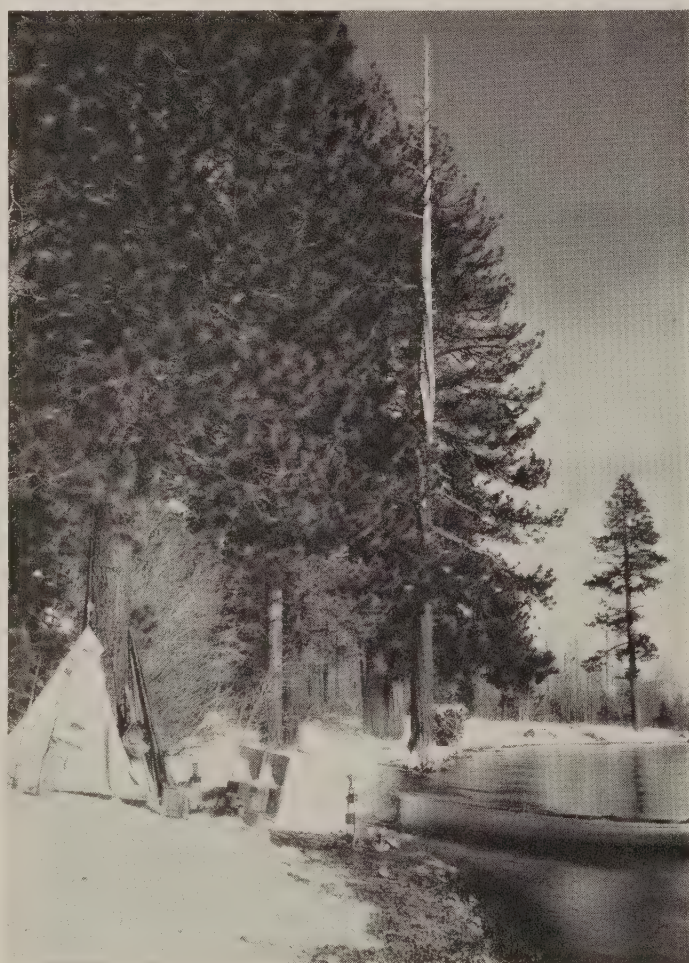
¹ Meteorologist, University of Nevada, Reno, Nev.

² Robert E. Horton.

unknown. Thus the span of active snow surveying now scarcely exceeds 30 years, and the pioneers are still the leaders while those who gave them aid and comfort are strong incentives and cherished memories.

First of the pioneers were Mixer and Horton. In 1900 Mixer, civil engineer, measured the water equivalent of the snow cover in the Androscoggin Basin, Maine, to determine its relationship to the spring flow of that stream where logs were floated to market and power was generated. Horton, hydrographer of the United States Geological Survey, in 1903-4 made the first American snow-sampler for cutting and weighing snow cores and prepared a map of the snow cover for New York State.

In the far West, quite unaware of these beginnings and stimulated by the desire to aid in settling the bitter dispute regarding the value of forests and mountains in conserving snow, the writer developed the Mount Rose snow-sampler in 1908-9, and with it charted the water equivalent of the snow cover in long traverses over the various types of mountain and forest slopes of Mount Rose (10,800 feet above sea level).



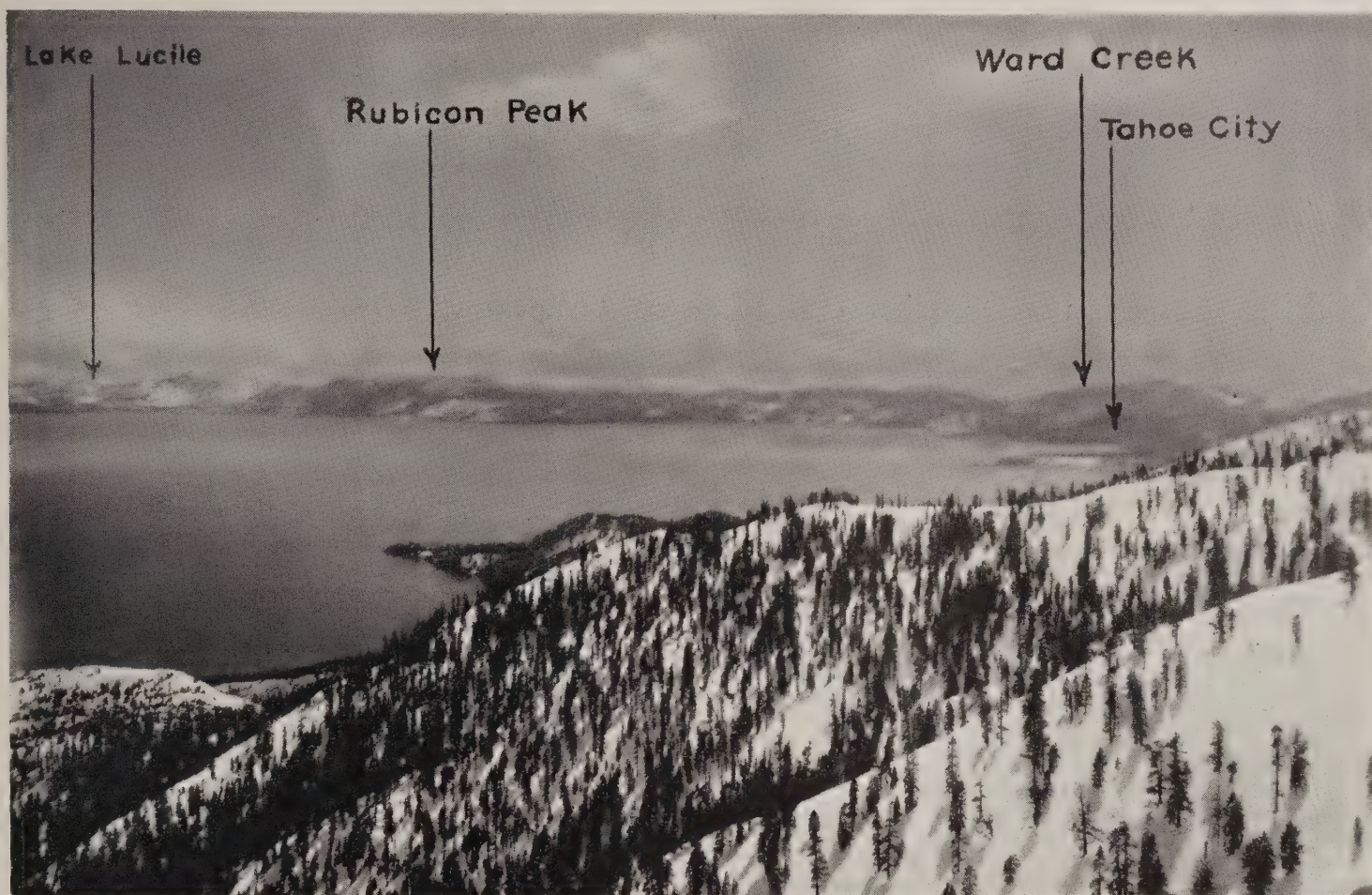
A mobile snow-survey camp on Lake Tahoe. The lake never freezes, thus affording a 72-mile coast line for reaching various types of snowfields.

Here overlooking Lake Tahoe—the source of the first United States Reclamation Project—and the recipient lands far in the dim desert to the east, the following forecast for irrigation was made for the season of 1911: “On Mount Rose the amount of moisture in the form of snow available for irrigation the present season was 44.4 inches, or almost double the amount (23.5 inches) available last season. Furthermore, on account of the lateness of the spring, 38.3 inches of moisture were available as late as June, whereas only 7.2 inches were available a year ago.” Meantime, in the Wasatch Range of Utah, in March 1911, J. Cecil Alter of the United States Weather Bureau inaugurated a snow survey in Maple Creek watershed which indicated that the snow-water of this stream “would spread 14 inches deep over the 5 square miles of rich fruit and farm lands reached by it.” Each of us knew nothing of the work of the others in the days of its inception. Snow surveying must have been in the air.

As already seen, the Nevada method was simple, consisting merely of a percentage relationship of the snow cover at its maximum, April 1, to the average or normal, and the application of this percentage to the normal of the streamflow from the snow cover during April-July, the period of snow-water runoff. Accuracy within 10 percent is usually attained, and the percentage of seasonal snow cover has been found so uniform over distances of many miles that the percentage in one basin can be applied to its neighbor. A few snow-survey courses will thus serve a wide area. Furthermore, costs of snow surveying are low. From this harmonious relationship of snow to runoff has been developed the science of snow surveying and streamflow forecasting—and the implicit confidence of water users.

State and provincial cooperative snow surveys have spread from Nevada to Montana-Alberta, Utah, New York, Oregon, California, British Columbia; and individual surveys have been organized in Wyoming, Washington, Newfoundland, Quebec, New Hampshire, Pennsylvania, and abroad in Sweden, Australia, and India. In 1935 the Federal-State Cooperative Snow Surveys were inaugurated by the Division of Irrigation, now a part of the Soil Conservation Service, to cover the Western States as a unit. Federal, State, municipal, and private organizations have united in common interest while Eastern, Central, and Western Snow Conferences have divided the snow States between them to adapt snow surveying to their local needs, whether irrigation, power, navigation, municipal water supply, or defense against floods or the effects of drought.

The benefits have been both tangible and intan-



Lake Tahoe, source of the first U. S. Reclamation project and scene of early streamflow forecasting. The names indicate snow-survey courses.

ible. The latter are the greater, for rivalry (originally river contest³) is ceasing and cooperation and confidence are taking its place. No higher praise has ever been given in water disputes than when it was said of A. V. Tallman when water master in Idaho that "He brought peace to the Boise."

Lake Tahoe is likewise a symbol of peace after storm. In 1910, after a period of uncontrolled water that had risen in 1907 to 11¼ feet above the dam, the lake residents threatened to blow out the dam unless the water was drawn far down each autumn. Appeal was made by the power company controlling the gates for the use of snow data from Mount Rose to estimate the seasonal lake rise. This year, 1942, when the lake once more began to rise above its limits, the lake dwellers complacently viewed the discharge of excess water until the maximum level was brought to rest 0.09 feet below the point fixed by interstate and Federal agreement.

Confidence in the snow surveys was so quickly built up with the legislature of the State of California that in 1920, when the lake was sinking steadily toward its rim, no protest was made at continued withdrawal of water for power; and in 1924 the

civic interests of California granted permission to the irrigators in Nevada to pump from the lake, on the assurance that its normal water level would ultimately be regained.

The tangible benefits of snow surveying also have been widespread. To draw an analogy from banking, the distribution of water is no longer regulated by the accumulated storage in the reservoirs but by the indication of the snow fields. In the early days of the Los Angeles Aqueduct, plans were made to divide the available water equally between Owens Valley and Los Angeles each season on the basis of snow surveys, but ultimately all water rights were purchased by the city.

In the adjoining Walker Basin, however, distribution was on the basis of priority from accumulated reservoir supplies, until one backward spring, when streamflow started late, new settlers on the East Fork, without early water rights, begged reservoir water to save their crops and their farms. The water board resolutely refused to "apportion what they did not have" but quietly advised the project engineer "to slip them a little" on his own responsibility and the assertion that an 80-percent snow cover was on the watershed. Next autumn the en-

³ *Rivus*, Latin for river; hence rival is a river man.

gineer proudly placed conspicuously in the center of the front page of the local paper the news item "Forecast proves accurate and saves crops." Since that year priorities have had only a broad significance in that area.

To go beyond the bounds of banking into financing, depressions in water supplies, commonly called drought, have been foreseen and adjusted before they occurred. A classic example has been provided by Utah and is best given in the words of George D. Clyde who organized and has long conducted the Utah Cooperative Snow Surveys:

"Snow surveys and streamflow forecasts were begun in Utah in 1923. In 1926 the first water shortage occurred. No quantitative measurements of probable shortage were available, but the deficient snow cover indicated a water shortage and a general curtailment of late-season crops followed. Those who reduced their late-season crops matured what they planted. Those who planted regularly did not mature a full crop. Much of their labor and seed was wasted. Five years later, in 1931, another drought was evident before the beginning of the planting season. This year the sugar companies would not contract beets until the water-supply forecast was available, and the banks would not lend money on crops before the extent of the probable water supply was known. As a result of these precautions most of the late-season crops that were planted were fully matured and the effects of the drought materially reduced.

"The drought of 1934, which was the most severe in the history of the West, taught many lessons, the most important of which was the necessity of having a full knowledge of an expected drought prior to the beginning of the planting season as well as full cooperation among users of water. Any year may be a dry year, but the probable extent of the drought which follows a deficient precipitation can be ascertained by a measurement of the accumulated precipitation which is stored in the form of snow on the high watersheds.

"It was known from mid-winter snow surveys over the Utah Snow-Survey Network as early as February 1934, that Utah was facing a serious drought. There was an extremely light accumulation of snow on the high watersheds and the earth mantle under the snow was dry. The lower watersheds were completely devoid of snow and the valleys had experienced only light precipitation. This early warning was emphasized by deficient precipitation during the months of February and March, and on the first of April, as a result of measurements made under the State-wide network

of snow surveys, it was clearly indicated that Utah faced the worst drought in her history. At that time the potential water-supply did not exceed 33 percent of normal. The conditions were brought to the attention of the farsighted Governor of Utah on April 1 and he immediately set in motion machinery necessary to meet the situation. He called the first drought conference in history to be held before the drought occurred. At this conference two lines of action were developed: First, to put into effect immediately a water-conservation program, and second, to begin immediately the development of supplementary water supplies so that they might be available by the time the crops needed the water.

"The water-conservation program involved an educational campaign to acquaint the water users with the situation and with the essential modification of acreage to be planted, methods of irrigation, and administration of the water to secure maximum use of the water available. Unusual as it may seem, the water users of the State, in the main, were unaware of the seriousness of the situation. They had not been in the habit of considering their water supply above their headgate. They assumed that water would come because it had always come before, and they did not take into consideration whether or not there was any water on the watersheds to supply the streams.

"As soon as the water users were convinced that a real shortage of water existed, they began planning and executing a program to combat the drought. They did not wait until the drought was upon them before beginning operations, and as a result they matured most of the crops they planted. They saved their orchards and perennial plantings, they moved their livestock off the ranges and out of the State before they starved, and they developed supplementary water supplies for irrigation and domestic purposes before the ordinary sources of supply dried up or got so low as to be insufficient to meet the minimum demands.

"The water-development program which was inaugurated upon the issuance of the water-supply forecast enabled the State to develop approximately 400,000 acre-feet of water in time for use in saving crops. Estimates based on measurements made during the season of 1934 indicate that a saving in crops alone due to the program of water conservation and development of supplemental water supplies was over \$5,000,000 in Utah. On the Bear River, which supplies lands in Utah and Idaho, a total of 150,225 acres were supplied with supplemental water by this program. It resulted in a saving in crops of \$3,149,000 in Utah and \$684,000 in Idaho, or

total saving of \$3,833,000 in the two States. In addition to this, a tremendous saving in livestock was effected through the Federal purchase plan which took the cattle off the ranges and out of the State before they starved or choked to death.

"The water-supply forecasts enabled municipalities to inaugurate early a water-conservation program and a supplementary development program which gave them sufficient water in most instances to carry them through the drought. It enabled power companies to provide supplemental steam-power in advance of its needs. Early warning of a water shortage enabled Salt Lake City (population 125,000) to develop a supplemental water supply of 40 to 50 second-feet from ground-water sources to avert a serious municipal water-supply shortage. Many small communities actually had to haul water for a short time until the supplemental supplies could be made available. These latter benefits cannot be evaluated in dollars and cents, but they rank high in prevention of human suffering and perhaps death."

Supreme in the annals of confidence and self-control where once water feuds existed, was the quiet acceptance in the Humboldt Basin, Nev., of a forecast in 1931 of only 10 percent of normal seasonal runoff and corresponding allocation of the scanty water to prior rights along the stream. A judge on the bench seldom inflicts a community sentence like this, nor was ever a judge more thankful that his judgment was true.

At the other extreme are floods that are frequently the creatures of more active elements than the snow but may be controlled by it. The value of the quantitative system of snow surveying in the Androscoggin Basin, where streamflow forecasting had its birth, is remarkably demonstrated by the timely warning of Paul L. Bean of the disastrous flood of March 1936 in New England.

To paraphrase Mr. Bean's report, a very thorough snow survey in the Androscoggin Basin indicated about 10 inches of water on the snow at the lower levels and 12 to 18 inches at the higher levels—an unprecedented condition, indicating a potential volume of flood water to pass Lewiston of not less than 60 billion cubic feet. The basin embraced slightly less than 3,500 square miles, of which two-thirds was entirely uncontrolled except for natural storage. As high altitudes predominate in the uncontrolled drainage area, it was clearly evident that if heavy precipitation accompanied by high temperature should occur, a flood of major magnitude could be expected. Moreover, the snow cover extended far to the south, was heavy, and showed little



An ideal glade for conserving snow. There is little interception but much shading. It is finally good practice to cut the forests into glades, since water has become as valuable as timber.

sign of melting. This condition clearly pointed to a sudden break, which actually occurred March 13, when the other necessary elements were provided to produce the greatest flood in this area within the memory of man.

It was the supreme experience of life to see a flow, greater than normally passes Niagara Falls, hurtling down a channel with a normal average flow of 1,800 cubic feet per second. Damage ran into millions of dollars; but there was no loss of life due directly to the flood, though several persons were so frightened that they died of heart failure.

Foresight and adjustment are the keys to water supply. The most recent experience is again the control of Lake Tahoe during the present season, from oversupply and the conserving of a deficient supply in the Androscoggin Basin. Mr. Bean again tells the story: "In this area it is interesting to note

(Continued on p. 115)



Some of the landowners agreed to install their own dams, especially if the structures were comparatively small. This is a downstream view of Hester's Dam on the Rio Hondo, built by the landowner. The dam is two logs high, with brush and rocks piled on the upstream side of the logs. SCS hauled logs to the dam site.

SCS HELPS NEW MEXICO FARMERS TO REPAIR FLOOD DAMAGE

BY DUNCAN SCOTT¹

In Lincoln County, New Mexico, two small streams—the Rio Bonito and the Rio Ruidoso—wind through narrow mountain valleys and come together to form the Hondo River, which flows eastward past the city of Roswell. Some 208 families live in the Ruidoso and Hondo Valleys and get most of their food and income from the 6,000 acres of irrigated farmland that borders the streams. Though limited in area, the arable land is fertile and yields excellent crops of apples, vegetables, small grains, and hay.

Ordinarily, life in these valleys is pleasant. But in September 1941, two terrible floods, spaced exactly a week apart, roared down the twisting channels. The second flood, on the 28th, was more damaging than the first.

¹ Division of Information, Southwest Region, Soil Conservation Service, Albuquerque, N. Mex.

Following a series of heavy rains that had completely soaked the ground, a deluge of 7 inches fell within a few hours on the Lincoln National Forest, which drains into the valleys. Water poured down the mountain slopes, gained momentum, and swept through the valleys in boiling fury.

Forty-one of forty-three rock and log diversion dams in the Ruidoso and Hondo Valleys, used to raise water to the fields, were washed out. Hundreds of apple trees, heavy with fruit, were uprooted and destroyed. Great holes were slashed in the land. Thousands of tons of silt and debris were piled on fields. Altogether, 1,800 acres of farm and orchard land were either completely destroyed or severely damaged, causing a total damage estimated at \$500,000. The tail-end of the floods broke over the banks of the Rio Hondo and inundated a large part

of Roswell, a city of 15,000 population.

Since an important railroad has water rights in the Bonito Valley, the company agreed to rebuild diversion dams that were destroyed there. But that left a large reconstruction job still to be done by private citizens in the Ruidoso and Hondo Valleys.

At the very time that the floods struck, farmers were organizing the Upper Hondo Soil Conservation District, and they asked their district supervisors to seek government aid in the rehabilitation work. O. B. Shook of Capitan, district chairman, A. T. Pfingsten of Hondo, vice chairman, and W. F. Coe of Glencoe, secretary-treasurer, went immediately to the Soil Conservation Service and to other agencies with their problems.

Word was passed on to the Soil Conservation Service regional office in Albuquerque, and soon engineers from that office and from the Las Cruces, N. Mex., area office were detailed to the area. W. B. Wroth, engineer for the Southern New Mexico Area, was placed in charge of engineering field activities, and C. A. Henderson, unit conservationist at Capitan, began the difficult task of planning flood reconstruction agreements with 208 different landowners.

Several local factors complicated the task of clearing away debris, repairing irrigation ditches and intake structures, and rebuilding the dams. First of all, many of the residents are low-income farmers who cultivate only a few acres on a family subsistence basis. This condition has arisen because a number of tracts, originally homesteaded, have been split among the heirs until often only a narrow strip of land is left for the family head. Thus, many landowners had little money for dam building, but they had to get water on their fields again if they were to raise crops in 1942. The second difficulty was caused by the flood itself, which widened and deepened the river channels, demanding larger dams than those that originally stood in the streams and threatening a lowering of

the water table in orchards. In the third place, time was limited. Engineers had only about 90 working days in which to construct sufficient dams to raise water to field level.

Despite great difficulties, most of these problems have been solved. The Service engineers surveyed each dam site and drew up specifications for the new structures. Under supervision of the Forest Service, CCC men at Camp 32-N, Hondo, have cut 7,500 logs on the Lincoln National Forest and hauled them in trucks to dam sites. One dragline was brought in by the Soil Conservation Service, and another was borrowed from the Fish and Wildlife Service of the Department of Interior. The State engineer's office let the district have trucks and other badly needed equipment.

By the middle of March, 15 log and rock crib dams had been completed, and the Service engineers were rushing to finish 10 more dams by May 1. Since the people living in the valleys had agreed to let 1 dam serve a number of farms by building flumes and lengthening irrigation ditches, nearly everyone will have water for crops this year. The most heartening thing that has arisen from the disaster is that landowners are working together, forgetting petty disagreements and selfish interests and contributing much of the materials and labor for the dam building.

When Mr. Wroth and J. G. Lindley, regional engineering chief, surveyed the destroyed dams, they realized that they must plan strong new structures that would cost as little as possible. For that reason, they agreed on the log and rock crib type of diversion, but, even so, the dams are costing from \$2,000 to \$8,000 each, if one includes the cost of materials and labor supplied by landowners. One of the dams, for example, is 84 feet long and 12 feet high. For some of the farmers, who chose to rebuild their own dams, the Soil Conservation Service crews hauled logs to the dam sites but did not assist in the actual dam construction.

The oldest people living in the Hondo and Ruidoso valleys say the floods were the most severe of any within their memory. Yet, they are looking to the future with optimism, now that Government agencies have helped in solving their immediate and most pressing problems. The attitude of W. F. Coe, member of a pioneer New Mexico family, is fairly typical. Coe lost 309 mature apple trees and suffered total damage which he estimated at \$10,000, but he recently said: "I've been in this valley a long time. My father got his start here in 1875 by trading a buggy and team for a 2-room house and a small farm. I intend to stay here. Everybody has pitched in and helped the district, and it looks as if we will get everything straightened out in time."

Just down the valley a few miles from the Coe place, across the Rio Ruidoso from the small village of San Patricio, is the 600-acre ranch and farm owned by Peter Hurd, nationally known Southwestern artist. Hurd, who lost above 5 acres of orchard land during the floods, is a conservationist at heart and has worked whole-heartedly in forming the district and in getting community action to repair flood damage. Hurd believes that flood reconstruction is a temporary program, but he sees that soil conservation is a long-term problem.

He tells an anecdote that bears repeating. One day, an old Spanish worker pointed to the hillside and said to Hurd in the Spanish language, "I tell thee, Pedro, the rocks are getting bigger." Hurd shot back immediately: "No, my friend, the rocks aren't getting bigger—the soil is washing away. If this land hadn't been abused so much in the past, we wouldn't have such big rocks and gullies today."

The people of the Hondo and Ruidoso valleys are becoming more conservation minded. The floods brought them together, as disasters usually bring people together. Gradually, all necessary dams will be rebuilt and the fertility of the valley lands will be preserved.

that, as a result of my snow surveys, I did obtain as much water in the lakes, and a little more, than the snow surveys indicated; the water content of the snow was not enough, however, to provide a fill unless we received average rainfall during the months of April and May. I went through the winter operating on the basis that during the months of April and May I could rely on approximately 50 percent of the average rainfall. As a matter of fact, we received practically none and my failure to obtain a 100-percent fill was almost entirely due to this drop in rainfall. Other areas in this State, which pay little attention to the water content of the snow, are practically empty today, whereas my reserves are from 42 to 43 percent full."

Thus in this year of world dislocation, the water resources of the North American continent—the continent that must be the source of ultimate world recovery—are fully known and are yielding maximum efficiency. They are, moreover, almost without exception, in superabundance. The original incentive to increase water supplies by conservation has grown into an international system of water appraisalment and control.

For the third straight year, the Governor of South Dakota proclaimed a Conservation Week for that State. This year's dates were September 13 to 19. Governor Harland J. Bushfield, in his official proclamation, put soil erosion's cost to the United States at about four billion dollars per year. He included the safeguarding of water resources as a part of the conservation necessity, called special attention to the desirability of providing for wildlife. He urged schools, civic groups, sportsmen's organizations and soil conservation districts to observe the week with appropriate educational programs.

FAMOUS AGRICULTURAL SOCIETY HAS IMPRESSIVE RECORD

BY C. R. ENLOW¹

Service personnel stationed in the Pee Dee Soil Conservation District in South Carolina are extremely fortunate—this is my opinion after attending a meeting of the Darlington County Agricultural Society. In its Agricultural Society, Darlington County, which is entirely in the Pee Dee District, has possibly the oldest farmers' organization in the United States.² The members of the society are well-informed, cooperative men, intensely interested in the soil and what it produces. The society is 97 years old. The Pee Dee District is 2 years old. The toddling infant has an old timer to help guide its wavering steps in the right direction.

The Darlington County Agricultural Society held its 97th Annual meeting at Mineral Springs on August 11. Dr. R. F. Poole, President of Clemson College (S. C. A & M) introduced the subject for discussion, namely, The Farmers' Part in the War Effort. Other speakers pointed out direct contributions that farmers could make through the liming of their soils, planting forage crops, practicing soil conservation, the growing of peanuts, and the production of hogs. Thus does the Society keep abreast of the times after almost a century of useful endeavor.

According to J. M. Napier of Darlington, the present secretary to the Society, it was organized May 5, 1846, with 56 planters enrolled as charter members. In the minutes of that meeting this statement is found: "A proposition was made to adopt for the government of the Society, the constitution framed for a Former Society at this place." This proposal was accepted, and W. E. James was elected president and W. H. Wingate, secretary. Unfortunately, there is no information to indicate when the "Former Society" was organized or who were the far-seeing planters who set in motion an educational movement that has continued to influence their descendants through the fourth and fifth generations.

At the time of organization, standing

¹ Chief, agronomy division, Soil Conservation Service, Washington, D. C.

² Information concerning other agricultural organizations that have been functioning for long periods is solicited by the author.

committees were appointed "... to deal with the various subjects connected with agricultural industry ... seek out and obtain the most correct and practical information ... and report the same ... for discussion and general consideration of the society." In its essential features this practice has been continued by the membership to the present time.

The programs of the organization impress one with the timeliness and practical nature of the subjects that have been under discussion throughout the decades. Prior to the War between the States the reports of the committee on "Treatment and Management of Slaves" received most attention. Likewise, in 1865 the subject was "Rules of Plantation Discipline and Wages, which if generally adhered to, would promote the interest of the landowners and secure just compensation and proper treatment to the laborers." The society pledged itself to further this relationship.

From its beginning the Society has encouraged and sponsored many things which the members felt would further agricultural development in their State. Subjects such as soil building, rotation, manures, fertilizer, improved seed, development of livestock, pastures, forage crops, gardens, orchards, small grain, plant diseases, and insects, together with better methods of producing cotton, corn, and tobacco, have all occupied prominent places on the programs presented at the annual meetings of the Society. The tariff, farmers' organizations, taxes, cooperative marketing, the AAA, freight rates—all these have received their share of attention. As long ago as the 1850's some of the members were conducting experiments with various crops and reporting their findings to the Society. Seventy-two years ago the Society developed and launched a county fair, and 69 years ago acquired a tract of land to be used as an experimental farm.

The records reveal that from generation to generation fundamental subjects relating to the agricultural welfare of the State have challenged the thoughts and interest of the Society. Of its membership and leaders none has striven more patiently, more

unselfishly, more effectively or with more far reaching results than did those two patriotic South Carolinians, David R. Coker and E. McIver Williamson.

The late Mr. Coker is known throughout the cotton-growing regions of the world for his work in improving the staple, quality, and yield of cotton; likewise, the late Mr. Williamson revolutionized the production of corn throughout the South with the development of the "Williamson Method" of corn production.

In a State that at times has experienced partisan politics, it is significant that the Society never has been touched by any political influence. In reviewing its history one is impressed by the continuity of family names. Sons have succeeded fathers in manifesting their interest in the organization. At any meeting of the Society one will find present a liberal number of descendants of the original charter members.

Interest in the meetings of the Society has never waned. It has survived wars, reconstruction, depressions, and prosperity. Since its organization it has missed holding only one annual meeting and that was in 1864. Records reveal the reason: "all the men were in the Army."

Life in the soil is susceptible to nutritional deficiencies. A balanced bacterial diet is a factor in crop production.

In considering ecological aspects of farming, food and nutrition must come first, comfort later.

SEEDING SMALL GRAIN

In drilling small grain, sufficient residues should be left on the surface between the rows to give protection against water and wind erosion until the young plants develop sufficiently to protect the soil. The common wide-space drills may be used with fairly good results. Where the residue is heavy, drilling small grain is rather difficult. Several new types of drills have been tested.—From the new Miscellaneous Publication No. 494, U. S. Department of Agriculture, "Using Crop Residues for Soil Defense."



Conservation on the march in Puerto Rico.

Employees of the Soil Conservation Service participated in a Fourth of July parade in Mayaguez, Puerto Rico. All sections of civic life in this town of 55,000 population were represented. SCS employees themselves paid for and constructed a float and other displays, and joined in the marching. Slogans proclaimed soil erosion an ally of Hitler and enjoined Puerto Rico to "fight it." In conjunction with a picture of General MacArthur was the statement, "He needs food for his army." Sandwich-board signs declared, "Without soil, there is no production of food" . . . "Without food, we have no soldiers."

"We came thru the Dec. 7th episode without personal injury or losses, but with a new experience which we trust will not be repeated, and grateful that all our children were on the mainland. We live a changed life here today, under the military Governor set-up, but are suffering no actual hardships or real essential privations, and we know that the change is necessary. Our research, though restricted in scope and volume, goes on as best it can with the efforts of our reduced staff. Shortage of field labor to get the actual field work done, is our greatest handicap."—Part of letter to A. E. Brandt, Soil Conservation Service, from R. J. Borden, Experiment Station of the Hawaiian Sugar Planters' Association, Honolulu.

I do think the Tar Hollow Nutrition Conference was one of the best I ever attended. It seemed to have the unique characteristic of falling within a com-

mon compass of a group of varied specialists, and I suspect that that common denominator was a fundamental interest in the health and consequent happiness of man.—John D. Detwiler, President of Canadian Conservation Association, London, Canada. (See October *Soil Conservation* for report on this conference.)

"I recently obtained from your Department 16 mm. sound on films, Muddy Waters, Rain on the Plains, Grasslands and Forests. I have shown these to most of our Cabinet Ministers and Members of Parliament, and our Prime Minister, Sir Godfrey Huggins was particularly interested. They commented on the great similarity of the conditions of some parts of U. S. A. to those prevailing in Southern Rhodesia. Our Information Officer is now showing these films to farmers, and our Native Department is then to take them over for use in the Native Reserves. We are very grateful for the help that we have been able to secure from your Department."—Part of letter to Wellington Brink, Soil Conservation Service, from A. S. Bright, principal, The Salisbury Polytechnic, Salisbury, Southern Rhodesia.

"My own experience has shown me that teachers often lack three things—actual information, proper viewpoints and teaching methods. I think our

Small Gleanings



Large sand dune completely stabilized by beach plum.

Laboratory is designed to give the attending teachers all three of these things. In Science, taxonomic studies are important. We must know the names of things because they are the building blocks of our environment. But the meat of the matter lies in the relationships which exist between these things. There is a profound ecology between a limestone pebble and the size of a farmer's silo and Science does not become education until we see it. And, not only must the teacher see it, she must know how to make her pupils see it—that's where the teaching methods come in. That is the job of the Conservation Laboratory, as I see it."—Part of letter from Arthur R. Harper, field naturalist, Conservation Laboratory, Tar Hollow, Ohio.

Beach plum, a soil-conserving hillculture crop plant, recently won first prize for Jackson M. Batchelor, formerly soil conservationist, hillculture division, Soil Conservation Service, now a lieutenant in the Army Air Forces at Miami Beach, Florida.

A fund was established in August 1940 by James R. Jewett of Woods Hole and Cambridge, Mass., from which two prizes were to be given annually for the scientific development and culture of the beach plum. Income from the fund provides a \$100 first prize and a \$50 second prize each year. The first prize is known as the James R. Jewett Prize and is awarded "to the person or persons making the greatest contribution to the scientific development and culture of the beach plum."—Hilda Cuniff, Hillculture Division, Soil Conservation Service.

On a typical Piedmont tobacco soil, one year's results indicate that soil loss tends to increase rather rapidly as the grade of the rows increases. Drainage, on the other hand, was practically as complete with 6 and 12 inches fall per 100 feet as on the higher grades.

Crop juggling is no substitute for soil fertility.



BOOK REVIEWS AND ABSTRACTS

by Phoebe O'Neill Faris

THIS LAND WE DEFEND. By Hugh H. Bennett and William C. Pryor. New York and Toronto, 1942.

In this book, just off the press, the Chief of the Soil Conservation Service and his associate attempt to cover an audience not yet reached by authoritative writings on the soil erosion problem in our country. The relatively small volume is in marked contrast to Dr. Bennett's "Soil Conservation" published in 1939 and now accorded world-wide acclaim as one of the most impressive and useful books of the century. "This Land We Defend" is in the style of the motion picture commentary, and much of the story is told by full-page photographs showing spectacular soil erosion caused by land exploitation and contrasting views showing the new pattern of conservation farming.

The historical *motif* is used throughout the book to present the facts about what we have done through three hundred years to bring our agricultural land to the point of requiring extensive overhauling to put it in shape for further profitable agricultural endeavor.

The latter part of the book in particular constitutes a sharp warning to us all—not to forget in the midst of war demands that conservation of the soil must go forward without interruption if we are to avoid a second post-war débâcle involving another series of dust bowls and hungry and disillusioned rural communities. The small volume is especially adapted for rapid reading by every American concerned with the security of his homeland.

A SURVEY OF EROSION, a Handbook. By the Soil Conservation Board of Victoria, Australia. Melbourne, December 1941.

The State of Victoria, Australia, now has a Soil Conservation Act, and a Soil Conservation Board. Thus, right in the middle of war, our friends down at the bottom of the Pacific get started—and keep going—with a program to protect their soils. They intend, and expect, to hold their land for many centuries to come, for the benefit of many future generations of Australians; and, what is more, they intend to put it in condition and keep it that way even while they fight the enemy who would take it from them—if he could.

Victoria is the second Australian State to pass a law and organize for the prevention of soil erosion and promotion of soil and water conservation farming methods—New South Wales was first. This handbook, designed for educational purposes, is based on the more extensive and detailed handbook entitled "Soil Erosion in Victoria" which is being used by land inspectors and other officials now engaged in

making a State-wide survey similar to the general reconnaissance erosion survey made by the Soil Conservation Service of the United States in 1934.

The different kinds of erosion—sheet, rill, gully—as well as accumulations of eroded material, are to be recognized and mapped, with variations in the intensity of each. In addition to the mapping of erosion, the surveyors are giving consideration to topography, soil types, and the vegetative cover. Topography is to be mapped as flat, undulating, hilly or very steep. Color and texture will be used in delineating the soil; also such characteristics as saltiness or stoniness will be observed and recorded. Considerable importance is being given to types of farming or land management; that is, dairy farms, sheep and cattle ranches, are separated from the wheat farm and the mixed farming enterprises. The dominant species of grasses or trees will be shown in both the range and forest country.

Characteristically, the Victoria Soil Conservation Board is not deterred by lack of specially trained personnel and funds in wartime: They are conducting this survey by utilizing the services of officials of the State and Forest Departments who have acquired a knowledge of land conditions in the conduct of their regular responsibilities.

Along with this Handbook the Soil Conservation Board of Victoria is distributing a reprinted article on the erosion control methods already in use at Dookie Agricultural College where the "problem . . . is the same as that confronting more than half the State—the safe disposal of storm-water." The work at Dookie consists chiefly of control of runoff in pastures and cultivated fields and treatment of gullies. Judging from this article, which is written by G. B. Woodgate, Principal of the College, the Soil Conservation Board of Victoria already has at hand an excellent demonstration.

EXPERIMENTS WITH BLACK LOCUST

We have an experiment under way at Pennsylvania State College to determine the effects of locust placed about 20 feet apart in a regularly managed pasture. We also have at the Hector Land Use project about 30 acres of pastures planted to black locust in a 20 x 20 foot spacing. In Maryland, we, in cooperation with the Experiment Station, have a number of plantings on farms of cooperators. The Experiment Station made a plant population count at the beginning of the test and was to make soil analyses at the time of planting, and to follow up changes which might occur later.—From a letter to C. R. Enlow from Grover F. Brown, chief, regional agronomy division, Soil Conservation Service, Upper Darby, Pa.

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Compiled by **ETTA G. ROGERS**, Publications Unit



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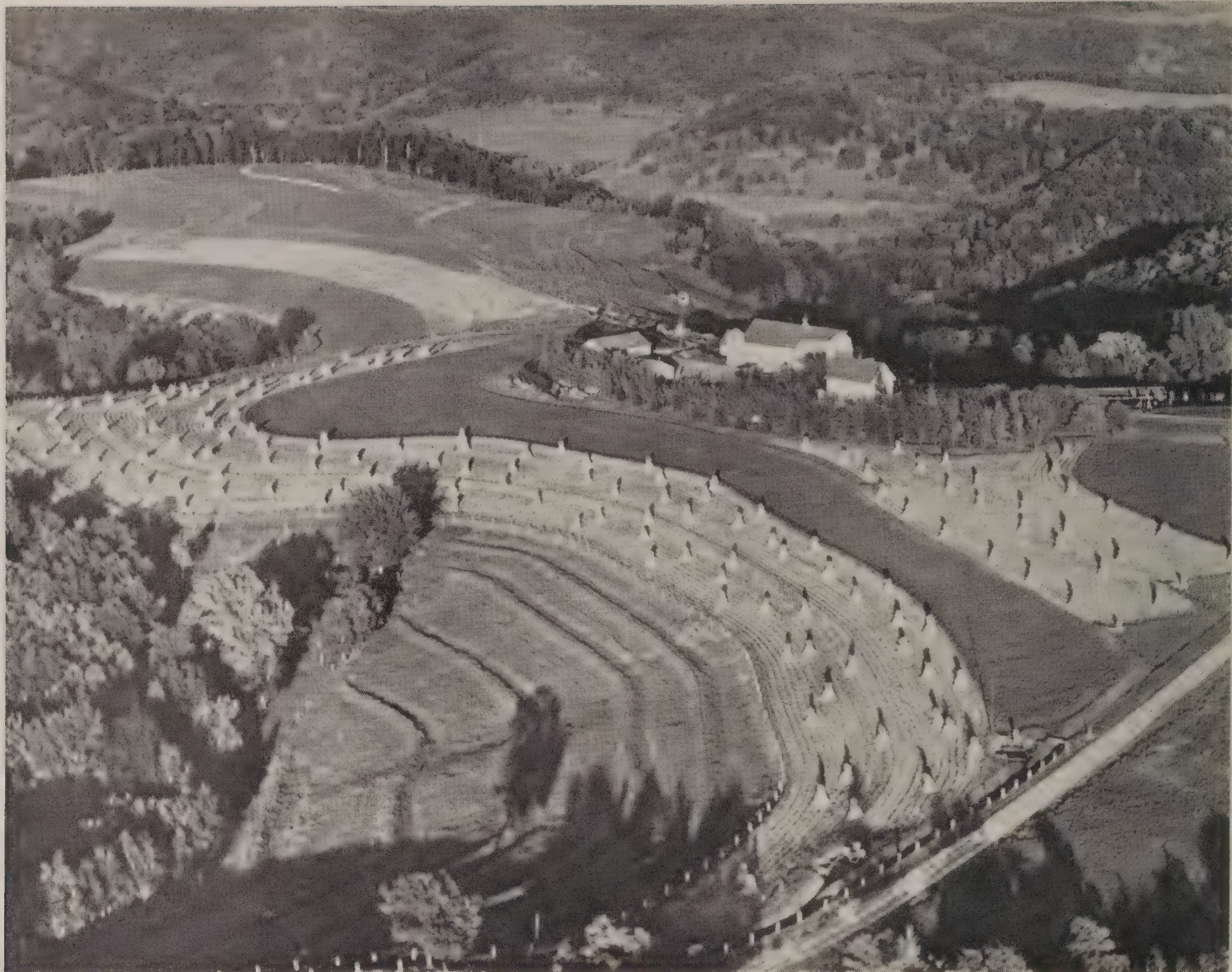
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"Design for Living"

AIR VIEW OF THE SOIL CONSERVATION EXPERIMENT
STATION, LA CROSSE, WIS. PHOTO BY JAMES N. MEYER.

DECEMBER 1942



SOIL CONSERVATION

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

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UNITED STATES DEPARTMENT OF AGRICULTURE - WASHINGTON

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WELLINGTON BRICK
EDITOR

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RUNNER PEANUTS, A PRESSING CONSERVATION PROBLEM

BY T. S. BUIE¹

It looked as if another of those afternoon thundershowers was making up in the west, but across the field of green peanut vines on Patterson's farm, a bright sun was shining from the Florida sky. In spite of the assurance of the sun, the Negro crew stacking peanuts at the far end of the field was working in silence—getting a crop of peanuts harvested this year was too serious a business for the song and laughter that ordinarily is a part of the harvest season. On this day too the call, "Water Boy!" that usually rings out with the deep, melodious note of a song, came from across the field with a high-pitched sound, as if it might have come from the throat of a girl. And so it did, as it turned out, for the crew of 19 workers was composed mainly of young boys, girls, and older women. They were brought each day to the farm from small towns as far away as 30 miles, Foreman C. B. Williams told us.



Stacking peanuts in the Holmes Creek soil conservation district in Florida.

A short time before at his hardware store in Graceville E. D. Patterson, chairman of the board of supervisors of the Holmes Creek Soil Conservation District, had explained some of the difficulties of getting peanuts harvested with inexperienced "town" labor. To make matters worse it had "rained

all the year," and with the ground still wet a side-delivery rake was useless for shaking the soil from the vines. Thus shaking as well as stacking was being done entirely with hand labor. But the peanuts had to be harvested, he added, and they were going to get the job done.

Out in the field where the crew was working, Foreman Williams

explained that he left the farm in a truck every morning about 1 o'clock to pick up his workers at their homes and got back to the farm around 6:30 a. m., when the field work began. At 5:30 in the afternoon he left with his crew for the return trip and usually got back to the farm at about 10 p. m. for a couple of hours' sleep before starting out again. In spite of this, he, like Patterson, was confident that they would get the peanuts harvested, and he expected to make 35 tons on the 40-acre field where the crew was working.

Throughout the runner peanut section of southern Georgia, southern Alabama, and northern Florida, this same determination among farmers to get the job done was evident this fall, in spite of many serious problems brought

¹ Regional conservator, Southeastern Region, Soil Conservation Service, Spartanburg, S. C.



A side delivery rake saves considerable time and labor in harvesting peanuts.

about by the increased production of peanuts to meet war needs. There is no doubt, however, that some growers were unable to harvest all the peanuts they planted; and many who increased their acreage this year were discouraged by the difficulties they encountered.

"I've heard a lot of people say that they are not going to plant any peanuts next year," commented George B. Mock, chairman of the board of supervisors of the Flint River Soil Conservation District in Georgia. "But I know these people here pretty well and I think they are going to do all that is humanly possible to get the crop harvested this year and plant the extra acreage we are going to need next year, too. If peanuts are needed to win the war, we've got to get the job done somehow."

As was the case with many other crops this year, the scarcity of labor was the principal difficulty in peanut production, and it is likely to be more serious next year. But peanuts have many peculiar prob-

lems of their own, nearly all of which were intensified by the greatly increased acreage needed in the war production program.

Any farmer who has grown a crop of market peanuts will tell you that the crop is extremely "hard on the land." The explanation is simple: When peanuts are dug, the vines which are used for hay are removed from the land as well as the nuts; thus this crop not only exhausts the organic matter and plant food in the soil, but leaves the ground entirely bare of cover except for any late weeds that may come in after the crop has been harvested.

In the runner peanut section, the tendency has been to produce peanuts and hogs together and let the hogs harvest a portion of the crop. This is not nearly as hard on the soil as the practice of digging the peanuts because the vines are left on the land. Nearly all producers

of harvested peanuts plant enough additional acreage to fatten their hogs by "hogging-off" this portion of the crop.

Runner peanuts are pretty well harvested by October 1 and there would be plenty of time to get a winter cover crop planted after that, except for another complication. A good portion of the counties in the runner peanut section of Georgia and Florida have no stock law and the common practice is to fence in the cropland and let the stock range over the countryside. After crops are harvested, the stock are turned into the fields to forage on weeds, stalks, and other crop residue during the fall and winter months. Naturally, the livestock damage any cover crops that may be planted after peanuts are dug.

The fenced area includes the peanuts for hogging-off as well as the harvested acreage. When pea-



Sam Williams examining a stack of Spanish peanuts on his farm in the Wiregrass soil conservation district in Alabama.



Threshing runner peanuts with a peanut picker in Flint River soil conservation district in Georgia.

nuts are harvested, it is impossible to get all the peanuts in the digging operation, and after the hogs have cleaned up the peanuts planted for hogging they turn their attention to the harvested acreage with typical porcine thoroughness. Hogs can do an excellent job of salvaging, thus eliminating a good deal of waste in peanut production and adding a lot of fat to the hogs; but this salvaging process also creates a difficult problem in the establishment of winter cover after harvested peanuts.

Cross fencing would enable the period of hogging and gleaning to be limited, so that winter cover crops could be planted at the proper time and become established without danger of being destroyed by the hogs rooting in the soil for peanuts left in harvesting. Unfortunately, very little cross fence-

ing is in existence in this area, and farmers will readily point out that they can't get fence material now on account of the war even if they could afford the cost.

Some growers in this section plant Spanish peanuts, and where this variety is used the problem of cover crops after peanuts is greatly simplified. Spanish peanuts mature about a month earlier than runners, and they must be harvested at once since they sprout quickly after reaching maturity. Whatever gleaning is done is over within two weeks after harvest, so that the planting of winter cover crops is not complicated by grazing.

Because Spanish peanuts mature earlier they are less subject to damage by the velvetbean worm—a factor that presented another serious problem this autumn on late harvested runner peanuts. A

heavy infestation of these worms will destroy the leaves on peanut vines in short order and ruin the vines for hay. When defoliation is severe, the small stems by which the nuts are attached to the vines will rot so that the peanuts are left in the ground when the vines are harvested.

Growers in the runner peanut section have a number of objections to Spanish peanuts. They are more familiar with runners and have their own supply of seed of this variety on hand. Spanish peanuts bring a better price per ton when sold for oil, but farmers say they can get more for runners in the long run because they get better yields per acre.

The principal objection to the Spanish variety in this area, however, is that Spanish peanuts and cotton mature at the same time and both are important crops. As C. B.

Hyman, of the Holmes Creek district expresses it, "It doubles up on a man to have Spanish peanuts and cotton, because both come off about the same time. With the labor situation what it is, that is a real consideration."

Contour farming is extremely important on land where peanuts are dug, because the bare, loose soil left after digging is subject to severe damage by erosion during heavy winter rains. Although a good part of the land in the runner peanut section has been terraced and is farmed on the contour, a considerable number of farmers still follow the old practice of planting and cultivating their crops in straight rows. In soil conservation districts, contour tillage is being adopted. Terraces are commonly used as guides for contour tillage on sloping land.

Soil Conservation Service workers recognize the problems involved in peanut production, particularly with reference to conserving the soil during a tremendous increase in production of a crop that is notably hard on the land. They have accepted these problems as both a responsibility and an opportunity, and they are carrying out an extensive system of field studies to work out solutions for the problems in cooperation with four soil conservation districts in the runner peanut section. Experiment station workers were called into consultation to assist in developing plans for field studies.

Since erosion control and maintenance of soil fertility are the primary objectives of these studies, types of vegetation that will reduce erosion losses and add organic matter to the soil are receiving first consideration. Major emphasis in these studies is being placed on determining the influence of certain winter and summer cover crops on the yields of peanuts and the problems involved in establish-

ing cover crops after peanuts are harvested, especially where peanuts must follow peanuts in the rotation in 1943.

Farmers are actively cooperating in these studies which, to reduce labor requirements, are being conducted on a field rather than a plot basis. Service technicians assisted farmers in getting yield records this fall where peanuts followed crotalaria, oats that was grazed and turned or disked, oats harvested for grain, blue lupine harvested for seed, hogged peanuts, corn interplanted with summer legumes, cotton, and dug peanuts.

The establishment of winter cover after harvested peanuts is being studied under a wide variety of conditions. In some of the studies small grain, ryegrass, winter legumes, and mixtures of small grain or ryegrass and winter legumes were sown immediately before peanuts were harvested so that the seed would be covered by the plowing required in digging. In other studies grain and winter legumes were drilled in at normal planting times after peanuts were harvested. Careful observations are being made of the damage done to the winter cover where the fields are gleaned by hogs.

Similar observations are being made in a number of other types of field studies where small grain and blue lupine were used. In some of these, oats or blue lupine was drilled in each peanut middle at various planting rates. In others, small grain and fertilizer, broadcast following harvested peanuts, were covered by disking and blue lupine was drilled in 18-inch rows immediately after.

Other fields where peanuts were dug were divided into three sections, one of which was left bare, a second planted to oats, and the third to blue lupine. One-half of each of the oat and blue lupine sections will be disked next spring while the plants are green and planted to peanuts. The other half will be interplanted with peanuts, and the oats or

lupine seed will be harvested with a combine when they mature. The bare section also will be planted to peanuts, and yields on all three sections will be recorded.

The value of leaving peanut vines on the land is also being studied by spreading the vines back on the land in one section of a field after picking, leaving another section bare, and then following with peanuts on both areas. Several different types of rotations with peanuts are being included in the field studies. Poor, sandy lands, as well as better soils, are being used.

The district set-up affords an excellent opportunity for carrying out these studies. In work units where a large number of field studies are under way additional aides have been assigned to assist farmers in making observations and gathering accurate data. District supervisors are giving active assistance in carrying out the studies. Seed patches established on farms as a part of the district program have furnished home-grown seed of adapted winter legumes for use in the field studies.

Within the last few years blue lupine, a winter legume that produces a large amount of easily harvested seed, has become an important winter cover crop throughout the runner peanut section. It is unpalatable to livestock and is used solely for soil protection and soil improvement. The regional agronomy division of the Service has encouraged planning technicians to include seed patches of blue lupine in conservation plans on district farms.

Farmers in Henry County, Ala., in the Wiregrass Soil Conservation District, until a few years ago were spending \$75,000 to \$100,000 a year for vetch and Austrian winter pea seed, according to C. F. Reynolds, district supervisor. Impressed with the seed-producing possibilities of blue lupine he made a trip to the Florida Experiment Station at Quincy, Fla., in September 1940 and brought back a ton of blue lupine seed, which was distributed to district farmers throughout the county for establishing seed patches.

(Continued on p. 140)

"The shape of a better world" seen in Land meetings at Louisville and Memphis

By Bert D. Robinson¹

"Of the billion people in the lands of our neighbors to the South and in Asia, 80 percent live on the land. The farms in China and in much of Latin America average less than 5 acres. Less than 20 percent of the people can read or

write, and their income is less than \$100 a year per family. They are scourged by diseases and bitter hardships . . .

"In the last 10 years we have turned an about-face in this country and are making at least a start

toward undoing the terrific waste as a result of bad farm practices of the 70 years that went before.

"If we share everything we learn with our neighbors to the south and across the Pacific, we shall see the shape of a better world."

THIS hope for a common brotherhood resulting from mutual help in providing for better use of the land and in improving human standards was voiced by Vice President Henry A. Wallace on October 17 as he spoke on "A Billion People" at the Louisville, Ky., meeting of the Friends of the Land. His subject had special reference to the agricultural populations of Latin America and the teeming Asiatic lands.

"Already North and South America are beginning to work together in the field of farm research and better methods," the Vice President said. He pointed with pride to the recent establishment of an Institute of Tropical Agriculture by the Pan-American Union as a means of improving tropical agriculture and bringing the peoples of North and South America into closer and mutually profitable working relationships.

As another example of close cooperation with other friendly nations, the Vice President cited the assistance the United States is giving China in its food production program. Dr. Walter C. Lowdermilk, Assistant Chief of the Soil Conservation Service, the Vice President said, has left for China at the latter's request to help that Government establish a soil and water conservation program



LOUISVILLE: Vice President Henry A. Wallace trades comments with Mrs. Luis Francke, conservation chairman of the Garden Club of America. Seated between them is Dr. Charles E. Holzer, president of Friends. To the left are Governor Keen Johnson of Kentucky and Mayor Wilson W. Wyatt of Louisville.

to ensure greater food production.

Throughout his address Vice President Wallace emphasized that the United States stands to benefit immensely from the experience other nations have had in dealing with agricultural problems. China undoubtedly has, he pointed out, in its long battle against erosion evolved a number of practical control methods that would benefit American agriculture.

Other nations, too, the Vice President continued, can help in this mutual undertaking for an improved agriculture. Canada and Australia can help, and the British and the Dutch with their long experience in tropical agriculture certainly can help farmers living in tropical countries, he added.

At both the Louisville and Memphis meetings of the Friends of the Land, the latter being held a week earlier, on October 12, attention was focused on possibilities that mutual assistance in soil and water conservation programs offer for fostering the good neighbor policy. A group of nine Central and South Americans, representing their agricultural departments or colleges, attended both meetings. They are the first of a group of 30 scheduled to study soil conservation methods being practiced in the United States. William X. Hull, of the Soil Conservation Service, who is conducting the initial group through the South, described the men as the most "eager" he had ever seen. At both meetings

¹ Associate information specialist, Soil Conservation Service, Spartanburg, S. C.



LOUISVILLE: Robert C. Tway, farmer and dairyman, right, swaps conservation ideas with three fellow Kentuckians. Left to right—Jim Bates, Jr., farmer and deputy administrator of Treasury's war savings staff; Governor Keen Johnson; Dean Thomas P. Cooper, director of the Kentucky Agricultural Extension Service.

of the Friends of the Land they mingled freely with others in the audience, exchanging information with farmers, lawyers, educators, industrialists, editors, and agricultural workers. More than 350 persons attended the Memphis meeting and 325 the meeting at Louisville.

Louis Bromfield, novelist and vice president of the Friends of the Land, declared at the Louisville meeting that the present war is a revolution, "the end of the happy-go-lucky, pilfering, wasting days" growing out of the devastation of the world's bounty.

"Our tradition," said Mr. Bromfield, "has been a wasteful one in this country. The average tradition of the American farmer, of the manufacturer, the average citizen, has not been a good one, an honorable one or a wise one. The condition of the American farmer can best be illustrated by the kind of farmer who began in Pennsylvania and ruined a farm there, went to Indiana and ruined another farm. By that time his son

went to Iowa and ruined one there and his son or grandson ruined one in Washington or Oregon. And now there isn't any more land. And because there isn't any more not only the farmer but every one of us has to take care of what we have."

At the Memphis meeting of the Friends of the Land Mr. Bromfield spoke about his native Ohio. His State, he said, has an ideal marriage between industry and agriculture. It has farm upon farm, broad and sweeping, and yet it has Cleveland, Cincinnati, Columbus, Toledo, Akron, and Youngstown.

"Yet, with all its wonders, Ohio lies in danger of decay," Mr. Bromfield asserted. "Its water table has dropped and one of the greatest States in the union is in danger of collapsing from thirst. The industrialist and the farmer have stripped Ohio's soil of all chance to catch the rain water. Every year 40 to 50 percent of our water runs down the Ohio into the Mississippi, and into the Gulf of Mexico. Along with that water go tons and tons of good soil.

"Industry in Ohio is in danger of an acute water shortage. Last year the great mills of Youngstown were within 2 weeks of shutting down because of lack of water. This year these same mills were within 24 hours of shutting down, defense or no defense, because of flood."

In the Mill Creek Valley area around Cincinnati there is also a water shortage, Mr. Bromfield said. One of the greatest industries, he continued, must soon leave if nothing is done. Recently a member of the board of directors of this industry, Mr. Bromfield learned, made the statement that there was no use to discuss further expansion in the Mill Creek Valley area because of the water shortage.

"Why did this happen?" Mr. Bromfield asked. "Is there any less rain in Ohio now than there was 150 years ago?"

"No," said Mr. Bromfield, "there is no less rainfall in Ohio now than 150 years ago. The answer lies in the fact that the land has been stripped, the forests cut down, and the fields left bare. There is little in Ohio now to catch the water to make it stay."

"We must win the battle of production on the farms of America as well as in our war industries," Dr. H. H. Bennett, Chief of the Soil Conservation Service, told the Friends at their Memphis meeting. Chief Bennett also was scheduled to address the Louisville meeting, but flood waters from the Potomac spreading through parts of Washington, D. C., interrupted his plans.

"We can win the war and still lose the peace in the years to come on the soil of America," Chief Bennett told his audience. "We could do this if we mined the land to get our vital war production, and gave no thought to the obvious fact that we'll need the land just as much after the war as before—perhaps even more."

Dr. Bennett said it is just as essential to keep our crop production facilities in good working order—to maintain them to carry the maximum load—as it is to keep the equipment in the airplane factories and tank arsenals in good condition.

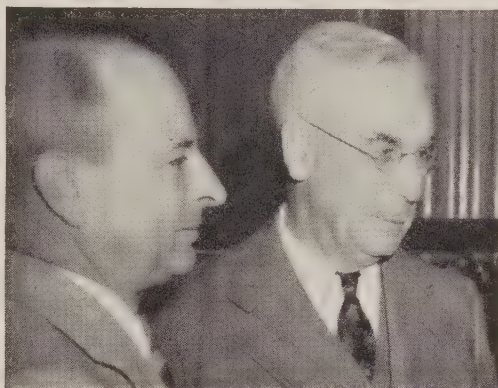
“We simply must be true ‘friends of the land’ if we want the land to be a friend to us—if we want it to keep on producing the crops we need to fight and win the war.

“If we figure that we will similarly have to keep up big production for 5 or 10 years after the war until the world gets on its feet again, the tremendous burden upon our land becomes obvious. And the responsibility of American farmers to keep that soil productive and producing becomes equally obvious.

“Within 5 years more than 2 million farmers in 42 states of the Union have on their own volition set up 793 legally constituted soil conservation districts, comprising approximately 463 million acres of land. Since these have been established, the Soil Conservation Service has cooperated with these districts, at the invitation of their



MEMPHIS: Good neighbors from Central and South American countries with H. H. Bennett, chief of the Soil Conservation Service, and Louis Bromfield, novelist. Left to right—Casiano Hector Quevedo, Argentina; Gonzalo Pedro Andrade, Mexico; Jose S. Juaregui, El Salvador; Bennett; Alfredo Gustale Antonelli, Paraguay; Anthony Lespes, Haiti; Emilio Zamudio, Mexico; Humberto Ortega, Mexico; Bromfield; Ricardo Leon, Mexico; and Jaurier Francisco Garcia, Mexico.



MEMPHIS: Edward J. Meeman, editor of the Memphis Press Scimitar and C. W. Bailey, president of the First National Bank, Clarksville, Tenn., get together.

democratically elected farmer supervisors. We have done everything in our power to help the districts with their action programs of conserving soil and rainfall, of using the land according to the capabilities of the land as scientifically determined, of protecting lowlands from deposition of poor subsoil material washed out of yawning hillside gullies, of draining water-logged areas of otherwise productive land, of protecting wildlife—and bringing security to those who till the soil and thus to the Nation.

“These soil conservation districts surely must like what has been done—and more has been done in them than I can tell you about now. Other agencies are helping, too; the extension services, the AAA, and other State and Federal agencies. It is of great significance, I think, that this, certainly the greatest land movement of all time in this country, has taken place so quickly. It has come about in a country where 10 years ago very few were interested in any aspect of the erosion problem; then, there was no general conception of the extent of the problem and not much knowledge about the physical aspects of the



KNOXVILLE: Forty-eight to 50 bushels of corn per acre, but before conservation measures were adopted the field would not make over 5. That's what H. C. Lewis, Anderson County, Tenn., whose farm is a TVA unit test demonstration farm, tells the novelist Louis Bromfield.

processes involved; and there was no national program of any kind for its control."

Also appearing at the Memphis meeting was Chester C. Davis, president of the Federal Reserve Bank of St. Louis, who declared, "unless we reverse the trends that have been ours since we started plowing up and destroying this land, we may be in the same situation that vast areas of China are in, where the great river flowing to the Yellow Sea is known as the River of Sorrows, and perhaps some day, unless we are more intelligent than my generation has been, the Gulf of Mexico may become the Yellow Sea."

"Latin America," continued Mr. Davis in referring to the group of nine men from Central and South America now studying soil conservation in the United States, "is represented at this meeting here today. That is fine because conservation of the land and of the water and forests can become a matter of international interest and international cooperation, and not simply a nation-by-nation movement."

John W. Apperson, of Memphis, in opening the Memphis meeting, read the following telegram from Secretary Wickard: "With every increased wartime demand being made on our farm land, the conservation of our soil and water resources becomes a problem of first importance. All power to your efforts."

Mayor Walter Chandler, of Memphis, welcomed those attending the meeting, and was followed by Russell Lord, editor of *The Land*.

"The City of Memphis," Mr. Lord said, "is as much a part of the land as a finger is a part of the hand; it is all one. There is a definite relationship. You see it between soil, lean cattle, children with thin legs. You have seen civilization breaking down in this

United States. But since 1936 we have seen some miracles. We will bring the land up to bloom like the rose again."

Mr. Lord also gave a short talk at the Louisville meeting in which he declared that the South was making great headway in conservation. The new land pattern—contours, strip cropping, and other conservation measures—is becoming more and more evident, he said.

The morning session at Memphis was followed by a luncheon at which Frank R. Ahlgren, editor of the *Memphis Commercial Appeal* presided. After the luncheon, Mr. Bromfield spoke on "Land of Our Fathers." At the afternoon session, presided over by Editor Edward J. Meeman, editor of the *Memphis Press-Scimitar*, the listeners heard C. W. Bailey, of Clarksville Tenn., tell of the country banker's attitude toward conservation. Mr. Bailey related how farmers in the Clarksville area found their way back after the bottom had fallen out of their tobacco market. They found diversified farming and conservation the answer to their problems. "And I don't mind telling you," Mr. Bailey said, "that most of our mortgages are paid off now—many of them are paid off too quickly for the comfort of the banker."

James P. Pope, one of TVA's three directors, described the value of conservation and modern farming methods in the TVA area. Mr. Pope's talk was followed by a panel discussion of "The Fundamental Process for the Restoration and Conservation of Our National Resources." Discussion leaders were J. Charles Poe, Nashville, Conservation Commissioner of Tennessee; J. P. Chase, Shelby County, Tenn.; T. C. Potts, Crenshaw, Miss.; Mrs. Luis Francke, Long Island, N. Y., conservation chairman, The Garden Club of America, and Dr. Norman Frost,

of Peabody College, Nashville, Tenn.

On October 11, the day before the opening of the Memphis meeting, the Friends sponsored a tour of the Shelby County Penal Farm where conservation measures have been effectively applied on soil that erodes easily. After the main meeting, a group made a field trip through TVA territory where benefits from conservation farming were plainly evident.

The panel discussion at the Louisville meeting pertained to natural resources in war and peace. Col. Richard Lieber, former conservation commissioner of Indiana, and creator of the Indiana State park system, was the panel leader. Others who participated in the discussion were: Dean Thomas P. Cooper, director of the Kentucky Agricultural Extension Service; Kenneth G. McConnell, Kentucky State forester; Mrs. Francke; Dr. T. S. Buie, conservator, Southeastern Region, Soil Conservation Service; H. S. Borden, supervisor of the Cumberland National Forest, Winchester, Ky.; Mrs. Kidwell Grannis, Flemingsburg, Ky., chairman, Kentucky Conservation Council, and Tom Wallace, editor, *The Louisville Times*.

Colonel Lieber in leading the panel discussion urged that conservation forces unite for an effective attack. "Piecemeal and sporadic activities of conservation," he said, "simply won't work."

Dr. Buie told the panel that conservation takes on greater significance in time of war as conservation farming helps increase or maintain yields by protecting or building up the soil's productivity.

"It is our obligation," he said, "to make each acre of land give its contribution no less than for every individual to do his part toward winning the war. Waste is sabotage. Waste is poor pa-

triotism at any time, but particularly so now."

Mrs. Grannis urged that conservation be made a subject for instruction in Kentucky public schools. "We have destroyed half of our natural resources in 300 years," she added, "and unless the trend changes we shall ourselves be destroyed."

"In 25 years of Federal farm loans," said A. G. Black, Governor of the Farm Credit Administration, "we have seen farms on which public money has been lent literally disappearing. We have seen them washed away. We have seen them blown away. We have seen communities wither as people are pushed from the land." In contrast, Governor Black pointed out that farmers who protect their land through conservation and better farming are better able to meet their loan payments and add to the Nation's stability.

Work of the Ohio Chamber of Commerce in conservation was described to the panel by William A. Mills, director of organizational relations of the Ohio Chamber of Commerce. He pointed out that the chamber was seeking legislation in his State to make it possible to issue credit on woodlands, "so



NORRIS: During a tour of TVA territory, Mrs. Luis Francke, Long Island, N. Y., and Mrs. Albert E. Thornton, Atlanta, Ga., learn about the agricultural progress of the Wheat community near Norris, Tenn., from Mrs. W. E. Gallaher (right), wife of postmaster and farmer. Farming and living standards in the community have been improved through assistance from TVA. Mrs. Gallaher is one of the 12 trustees who help plan and direct affairs of the Wheat community of 81 farms, 107 families, 9,000 acres.

the farmer won't have to cut down his trees to pay for schooling his children, for taxes, for other necessities, or for emergency needs."

At the luncheon, Mayor Wilson W. Wyatt introduced Gov. Keen Johnson, the latter in turn presenting Vice President Wallace. Governor Johnson made a strong

plea for a united conservation, and cited the progress Kentucky farmers themselves are making. He pointed out that farmers in his State since the enactment of the Kentucky soil conservation district law have formed 18 soil conservation districts, embracing more than 3 million acres.

Urging greater international cooperation for the development and establishment of better farming methods and improvement of human standards, Vice President Wallace in addressing the October 17 meeting of the Friends of the Land at Louisville, Ky., said:

"I know that bread cast upon the waters this way will return to us not after many days but in a remarkably short period of time in the form of a better world for all.

"It is not only Christian to be a good neighbor, but it pays to be a good neighbor."

COWPOWER SOLVED HIS PROBLEM

By A. T. SEMPLE¹

John and Mary Brown had returned to their ribbon-bedecked patch on the aerial map of a rich Corn Belt county. Both were tired and a little discouraged. They had not talked much on the way home. Farm work had piled up and they wondered how they would ever get it done.

They had spent a busy afternoon in the county seat. Mary had delivered eggs and dressed chickens to several families, as had been her weekly custom for many years. A can of cream had been left at the Fair Valley Creamery on the way into town and the can picked up on the way home. They had taken a week's supply of beef and lamb, some frozen strawberries, peas and stringbeans from their cold storage locker. John had learned from the Agricultural Conservation office that he could substitute soybeans or other war crops on his allotted acres for wheat. He had tried the three hardware stores of the town before getting the nails and some other hardware he needed.

The prospects for getting a corn husker were not good even for next year, and he would have to wait 2 or 3 months to get the repairs he needed for his tractor and combine.

After the chores were done and they were eating supper, Mary tried two or three times to start the conversation which usually continued until they had covered the events of the day and made their plans for the morrow. Finally she ventured, "John, I know you are worried because Henry told you this morning that he can make four or five times as much working at the ordnance plant over at Johnsonville. Do you think he will quit before corn shucking is over?"

"Yes, I'm sure he will as soon as his month is up next week. I tried to tell him how much more it will cost to live and how crowded the school over there is, but it's no use. He thinks he can make enough in 2 years to buy a small farm. He hasn't figured if he can save enough."

"What are we going to do then?" Mary interposed. "I know you can't find another worthwhile hand anywhere. Of course you can count on me to help get the corn out, but we may be at it until Christmas."

"You're plucky, Mary, but I won't stand for that. You are doing more than your share now with the housework, the garden, the chickens, and nursing sick neighbors. There must be some other way. Perhaps Bill can get a week's furlough from camp, or the telephone company will let Dave off for a week or two. Then I could do the rest."

"But, John, that would only take care of this year's corn crop." Mary was always looking ahead. John worked hard from day to day and often found himself loaded with more than he could get done.

Just then the phone rang and Mary hurried to answer it. It was Sam Becker, their neighbor, who kept cattle in his feedlots the year 'round, and was now trying to break his records of the first World War in fattening beef for the Army. Mary listened for a moment and then turned to John. "It's Sam. He wants some corn—he's going to Kansas City for more feeders."

John picked up the phone. "Hello Sam. Still at it, are you?"

"Corn," said Sam. "Corn is what I want. How about selling me a thousand bushels? You've got more this year than your hogs can eat—"

"I'd like to, Sam," John broke in, "but I'm thinking of sealing it. The market looks low."

¹ Head, pasture section, agronomy division, Soil Conservation Service, Washington, D. C.

"I'll give you 3 cents over the Boonetown elevator price," said Sam urgently. "You take care of your land. You get good corn—"

John was thinking fast now. "I'll take elevator price if you'll take it out of the field," he offered with a grin on his face that Sam could not see.

"Only way I can do that is turn the steers in," was Sam's quick answer.

"It's a deal," said John as his grin broadened. "That is, it's a deal if you'll take them out when the ground is muddy."

"You know I'll do that. What kind of a farmer do you think I am! Well, so long, John. I'm starting for the yards tonight."

"Good luck, Sam. Of course you understand that I'll husk test rows and take the yield and that your hogs will clean up after the cattle."

John chuckled as he started to help Mary with the dishes. "We're short of manpower and horsepower, Mary, but we've got cowpower now," he remarked.

Mary was smiling, but she was looking ahead again. "You're smart to get the work done like that. I'll bet you'll be trying some such trick again next year. You will, won't you?" she challenged.

"Say, that's a good idea, Mary. But how are we going to plant and tend 80 acres of corn besides the oats and soybeans and hay, and raise all the chickens and hogs Claude Wickard wants besides? You know—"

"Now listen," Mary interrupted, "don't you remember what it says in our farm plan? Let me get it—" She thumbed through the desk compartments. It wasn't there. She looked at John accusingly. "What on earth did you do with it when Mr. Blalock, the SCS man, was here to help you lay out those contours?"

He looked around the room as though he hoped to see it hanging on the wall. "Oh, I remember. I put it behind the big clock!"

Soon they had their agreement with the Kickapoo Creek Soil Conservation District spread out on the dining room table.

"There, what did I tell you!" Mary was excited. "Under crop rotations it says 'On fields 1, 2, 3 and 4, a 4-year rotation of corn, corn, oats, red clover and alfalfa. On fields 5, 6, 7 and 8 the rotation should be corn, oats, wheat and clover.' It says, 'In an emergency, such as the failure of the red clover and alfalfa stand in the oats, the clover and alfalfa established the previous year should be left for another year to maintain the balance of crops.' Now John, we have a good stand of clover in the oats, but we're badly out of balance on labor. Why can't we leave this year's meadow another year for cow pasture instead of plowing it up for corn? Then we'd have one field of corn, one of oats and two of clover in this rotation. This war is certainly an emergency, and I've been hearing how they need more milk for drying. Let's use cows to do part of our work—I'm sure Mr. Blalock will agree. You have been wanting some more cows ever since we put in electricity and you bought that milking machine to keep Bill on the farm."

John was a little confused at all this rapid-fire planning. "I'll have a time getting enough cows to eat 40 acres of grass," he said dubiously. "But maybe Sam can get me a carload of heifers; and Fred Anderson has cows but never enough pasture—always wanting to rent some. And, Mary, there still will be more work than I can do—if we get more cows we'll have to put up more hay . . . Fat from grass ought to do about as well as what we have to plow for . . . All this

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How the terminal is pruned.

CHRISTMAS TREE FARMING

BY WESTON DONEHOWER
AND D. J. SACCO¹

Very worth while for foresters is a visit to the 900-acre farm of 63-year-old Andrew Abraczinskas near Catawissa in Columbia County, Pennsylvania. Full of enthusiasm and wisdom born of 35 years of "learning something every day" in forestry practice, he has demonstrated that forestry pays. Today, after having developed a highly successful fruit-growing business amounting to a crop of 20,000 bushels of apples yearly, and supplemented by a yield of 20,000 bushels of potatoes from his cropland, he is turning to trees as his principal industry.

Mr. Abraczinskas' interest in trees and other woody vegetation dates back some 28 years when a spring from which he obtained water dried up following clear-cutting of a neighbor's woodland. To restore the spring, the adjoining land was purchased and replanted to trees. In a few years water again appeared at the spring hole and the planted acres gave promise of becoming an important economic producing unit of the farm. Additional land was purchased in the form of abandoned farm land—land

¹Zone technician and junior forester, Northeastern Region, Soil Conservation Service.

ONCE GULLIED FARM NOW A MONEY MAKER

BY E. B. GARRETT¹

Amos Butler has stamped the victory pattern on his 74-acre farm near Reidsville, N. C. The new pattern ensures not only greater production of crops needed to win the war, but complete protection against erosion as well and a better living for the Butlers.

He bought the farm in 1932 after quitting his job as a shipping clerk. He found the farm badly run down; gullies were large and deep, and from most of the land the topsoil had been washed away. Today, however, few persons would recognize it as the same farm. All the cropland is terraced and strip cropped; all row crops are planted on the contour, and improved rotations, including grasses and legumes, are building up the productivity of the land. The gullies have disappeared and natural draws in the fields are now hay producing meadow strips. These conservation measures, Butler says, not only have held erosion in check; they have helped increase his crop yields and they make farming a pleasure instead of drudgery.

As might be expected, the first years on the run-down farm were disheartening to Butler and his young wife. Tobacco yields were low, and it seemed almost hopeless to try to keep the gullies in his fields from becoming larger and deeper. Each heavy rain washed more soil away. The first year his net income from the farm amounted to \$385.30, considerably below the figure he had hoped to realize. But 10 years have now passed since he bought the farm—last year his net income was \$2,075.93, an increase of \$1,690.63.

Butler's progress in making his farm a paying proposition is best revealed by two sets of figures, one covering the net income for the first 5 years on the farm and the other the last 5 years. The first 5 years his net income rose from \$385.30 to \$1,098, largely as a result of sheer doggedness to make the farm pay. The second 5 years the net income mounted from \$1,432.17 to \$2,075.93—and it was during that period that he switched to conservation farming.

This farmer tells us that as a result of conservation farming the quality of his tobacco has been improved and the annual yield per acre raised from 800 to 1,200 pounds. He says also that this improvement in yield and quality is largely due to planting tobacco on the contour and following a 4-year strip rotation. The first and second years he grows ryegrass as a cover crop following tobacco; the third year he grows small grain in the strip which is later planted to redtop grass; and the fourth year the strip is in redtop from which he harvests hay. By employing this rotation and alternating it in contour strips, he manages to keep his tobacco land in a sod crop at least half the time—a system designed to cut down soil and fertility losses from erosion.

Amos Butler does not depend upon tobacco for all his income. His AAA allotment provides for putting 7 acres in tobacco, leaving the remainder of the cropland for grain and hay. When he first began farming he had only a "plug" mule and no cows. Now he has two well-fed mules; he milks two cows, and is raising two heifers for additional milking. Formerly he realized little income from his dairy and poultry products, but in late years he has been receiving \$600 to \$800 from these

¹ State conservationist, Soil Conservation Service, Raleigh, N. C.

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sources. Last year Mrs. Butler canned 300 quarts of vegetables and fruits grown on the farm for home use, and late in winter 15 quarts of meat. This year she expected to put up more canned goods. The Butlers always have an ample supply of home-grown pumpkins, peas, onions, sweet potatoes, Irish potatoes, and other vegetables.

Although he seldom hires help and has no tenants on his farm, Butler never allows himself to get behind in his work. For one thing he is quite methodical—he plans his season's work several weeks ahead instead of following a day-by-day routine. Moreover, he conscientiously follows the detailed conservation plan developed for his farm by the Dan River Soil Conservation District which includes Stokes, Rockingham, and Caswell Counties, and a large part of Person County. His farm is in Rockingham County, and if a baffling conservation problem arises he loses little time in consulting the local Soil Conservation Service technician assigned to the Dan River district.

Soil conservation has become a gospel of the land to Butler. After each heavy rain he may be seen going over his farm checking on how his terraces have held and making any repairs that may be necessary. He frequently participates in group meetings sponsored by the district for developing conservation plans for farmers. Hundreds of farmers who have visited his farm now have some of the same conservation measures on their farms that Butler follows.

This year the Butlers are making every effort to grow more food and produce more dairy and poultry products—they are fully aware of the role food is playing in the war. They take an active part in community meetings on victory gardens, local scrap iron campaigns, and in programs sponsored by the Dan River district to help farmers increase production.

Today with the Nation at war Butler feels that conservation farming is more important than ever before. As he remarked, every acre must be put to its best use and the land must be protected against erosion and kept in good condition. Idle or waste land has disappeared almost entirely from the Butler farm. For several years a small piece, about one-half acre, that formerly had been used as a county road in front of his home worried him considerably. This piece of land was badly gullied. He reworked it and today it is covered with a thick grass sod from which he cuts a considerable amount of hay. Last spring Butler cut all willows and brush from a 6-acre piece of bottomland and now he is converting it into pasture. He manages his 17-acre woodland on a sustained-yield basis so that he will have enough timber for future use as well as current needs.

Working closely with County Agent F. S. Walker and the AAA, Butler keeps detailed records on his farming operations. His operating expenses during the past 5 years increased 5 percent over the previous 5 years, but to him this is insignificant in view of the increased income he now receives from better yields and a more diversified type of farming. His payments from AAA have been more than sufficient to cover cost of installing the erosion-control and better land-use measures recommended

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"Son, if you ever go into farming, grow enough hay to feed your cows and mules"—good advice to the nine-year-old, Billy. Father and son are looking at hay grown on a meadow strip which winds over a long natural draw where gullies once dominated.



This hay-producing strip in front of Butler's home was once a badly eroded, abandoned roadbed.



Butler cleared this six-acre lowland of brush last Winter, seeded it in the Spring. Soon it will be furnishing pasture for cows.



Checking his tobacco bed, Butler said, "I would rather have more plants than I need and give some away than not have enough."



CHRISTMAS TREE FARMING

(Continued from p. 134)

whose soil had been allowed to wash away or deteriorate through lack of management—land identical to thousands of acres now lying barren, eroding, tax-delinquent, and economically parasitic.

These idle, weed-strewn fields now are planted and the woodland has been placed under management. Labor and equipment find full employment. Nearness to the anthracite region affords a ready market for mine material. Much of his harvest in timber is manufactured in his own sawmill and planer, and is used on the farm or sold to local markets.

Mr. Abraczinskas harvests 9,000 Christmas trees annually, and sells them mostly on a wholesale basis. He is building up his business to an annual sale of 60,000 trees, and says that his market would take 100,000 if he had them available. Dealers call at the farm with trucks for their purchases. The trees are divided into three grades, the two lower quality grades going to wholesale trade at prices ranging usually from 30 cents to \$1.50 per tree. The higher grade product is retailed at the farm at from \$1 up, with some, the large and well-formed trees, commanding a price of \$4 or \$5.

The general practice is to harvest trees within 6 to 8 years after planting. With the cultural treatment given, this results in compact, well-formed trees from 6 to 8 feet in height. A few smaller "table" trees are also sold. Mr. Abraczinskas says his markets call for Scotch pine almost entirely, with only a small percent of his sales being white and red pine, Norway spruce, Douglas fir, etc. He thinks that the bluish-green color and "bloom" on his Scotch pine, which is very attractive under electric lights, accounts for this preference. One of his problems is to develop Scotch pine with this desired color, rather than the yellowish-green common to the species.



Pruning terminals and laterals produced this typical Scotch pine Christmas tree.

Using inexperienced labor, and oftentimes young boys, he claims that each man plants up to 1,500 trees per manday. He says that, incredible as it seems, this result is obtained by using a sub-soiler set at a 6-inch depth, and dragged along the approximate contour by a tractor, which loosens the soil but does not turn it over; this soil condition enables the planter to set the trees with his fingers—he uses no tools of any kind except his feet to stamp the loose dirt tightly about the roots. This last act, Mr. Abraczinskas says, is very important in that it removes all air space about the roots. The plantings have been highly successful, and apparent survival (checked by the authors) was at least 90 percent in all cases observed. The 1941 spring planting, when visited the following August, showed better than 95 percent survival.

A good Christmas tree must meet several important specifications, namely, proper size (height and breadth), color, and form (compact and well-balanced growth). There are, of course, other factors such as tenacity of needles in remaining on the tree, texture of needles, etc., which also influence the demand and grade, depending on the peculiarities of the particular market served. To obtain the

above qualifications, Mr. Abraczinskas has developed and is perfecting the treatment described in the following paragraphs.

By observing each tree every year after planting he determines which of them need attention to develop balance and compact growth. His objective is to develop compact, full-formed trees. With this in mind, he uses an ordinary knife to cut off portions of the lateral and terminal shoots that appear to be gaining too much length. On Norway spruce this operation may be performed any time before the buds are set for the following year's growth, but on pine the shoots must be pruned just about the time the newly developed leaves in last season's buds have reached mature size. This results in the formation of many buds (as many as 17 were counted) on the tip of the severed shoot. If the cutting is done too late in the season, new buds fail to develop on the pine until the following year, and thus a season's growth is sacrificed.

In addition to inducing more branches in each whorl by cutting off the terminal, the pruning operation on laterals results in the development of additional shoots and contributes to the desired greater density of foliage. Since the maturity of needles and growth of each tree varies, this treatment becomes a matter of working with each individual tree and is undoubtedly a time-consuming operation. Repeated visits must be made to the same groups in order to reach all trees at the proper time. Nevertheless, by carrying on this tree-forming work, the percentage of salable trees is increased from 33 percent to 90 or 95 percent.

Regarding the practice, sometimes used, of leaving the lower whorl of branches on the stump of harvest trees for development into other trees, Mr. Abraczinskas' comment was that he didn't consider it worth while. He believes in "fillers," that is, replacing the harvested tree with a new plant.

Estimating his investment in Christmas tree culture 8 years after planting

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Grass Roots Conservation Training of AAA Com- mitteemen

By Arthur W. Susott¹

Georgia's 3,000 AAA county and community committeemen—all farmers—are stressing soil conservation at the grass roots as never before. They are telling their neighbors and other farmers they meet that it is a patriotic duty to put conservation on the land as quickly as possible. The committeemen have seen for themselves in soil conservation districts and elsewhere that well-rounded conservation programs on individual farms enable farmers to keep their land productive for raising large quantities of food and other farm products needed by Uncle Sam and his allies to win the war. Moreover, Georgia AAA committeemen are setting good, practical examples for their neighbors by doing a better conservation job on their own farms. Some have been cooperators of soil conservation districts for some time; others, wishing to go all the way in conservation farming, have applied to the districts in which they live for detailed plans for their farms.

This special wartime effort of AAA committeemen in Georgia to get more conservation on the land quickly, is largely the result of training meetings that the Soil Conservation Service and the Agricultural Adjustment Agency held this year throughout the State for the AAA committeemen. Naturally, close teamwork among the AAA and SCS workers in Georgia was required to complete the training work for the committeemen in 157 counties that had been scheduled from the first of the year to late in August. Conservation training programs for agricultural workers are also producing gratifying results in Alabama, Mississippi, and a number of other States in the Southeast.

From the beginning of the training work in Georgia, the AAA State Committee urged all committeemen to apply to their local soil conservation districts for complete conservation plans for their farms. The training meetings for all the counties in the State were completed by August 20, and now follow-up meetings with the county and community committeemen are being held to talk over means of making the farms models of sound conservation farming. The Coosa River Soil Conservation District reports that complete conservation plans have

been developed for farms of all committeemen in the four counties that form the district.

At each training school it was pointed out that too many Georgia farmers still are not making use of all the available AAA soil-building assistance, and that this assistance can be used to an advantage in establishing a complete soil conservation program on the farm. The AAA committeemen attending the training meetings gathered around two miniature models of a farm. They first studied the model showing the farm before conservation measures were applied. Then after a discussion of changes in land use and suitable erosion-control measures which the committeemen themselves might apply if they owned the farm, a district conservationist of the Soil Conservation Service uncovered a companion model of the same farm with the conservation measures already established.

Of course, not all the committeemen agreed on all points of the conservation program portrayed by the model, and some of their suggestions no doubt would improve the plan. But on two important points all the committeemen agreed: first, that more Georgia farms need conservation if they are going to do the war job expected of them; and second, that a larger number of those simple conservation practices that the farmer himself can establish on his farm this year should be emphasized. Most of these simple practices, listed in the 1942 AAA handbook for Georgia, are eligible for soil-building payments.

Typical of the AAA committeemen training meetings in Georgia was the one held late in July, at Americus, for the committeemen from Schley and Sumter Counties. During the afternoon the committeemen visited the 200-acre farm of H. J. Woodruff, a cooperator of the Lower Chattahoochee River Soil Conservation District—most of the other training meetings also provided visits to farms of district cooperators.

Unfortunately, rain prevented the committeemen from going over the Woodruff farm, but in their discussions with the owner they learned that his gross income will be at least \$3,000 greater this year than it was in 1937 when he first moved to the farm. This farm is regarded as one of the best managed farms in Sumter County—a striking contrast because when Mr. Woodruff moved on it in 1937 he found the topsoil gone from most of his cropland and gullies beginning to form in a number of fields.

The committeemen were impressed by Mr. Woodruff's results from conservation farming. He said that his cotton yield has increased from 300 to 450 pounds of lint cotton an acre on his 40-acre AAA allotment. At a market price of 19.7 cents a pound,

¹ Chief, regional division of information and education, Soil Conservation Service, Spartanburg, S. C.

Mr. Woodruff figures the increase in yield adds \$1,182 to his annual income.

His corn yield since he took over the farm has climbed from 20 to 40 bushels an acre. He plants 55 acres to corn each year, and the increase in yield, at 98 cents a bushel, means \$1,078 more annually on the corn crop.

Likewise, the increase in oats and wheat yields are providing more income. Mr. Woodruff now raises 60 bushels of oats to the acre as compared to 40, and 25 bushels of wheat as compared to 15. On the 30 acres he plants to oats the increase in yield is worth \$300, when computed at 50 cents a bushel. The extra income from a better wheat yield he figures at \$172.50, based on a planting of 15 acres and wheat selling for \$1.15 a bushel.

These increases in crop yields, Mr. Woodruff explained, resulted largely from contour farming, terraces, and improved crop rotations calling for greater use of such soil-building legumes as Kobe lespedeza. Mr. Woodruff was one of the first farmers in Sumter County to grow Kobe lespedeza, and last year he harvested 5,000 pounds of seed from a 10-acre field that had been planted in wheat the year before. From the sale of Kobe seed he realized \$500, or an average of \$50 an acre.

One of the first jobs Mr. Woodruff completed after receiving his conservation plan from the Lower Chattahoochee River district was to establish a system of terraces and water-disposal areas so that the run-off following rains could be handled with a minimum of soil washing. He was very much displeased because of the rain on the day the committeemen visited his farm, as he had wanted to show them his 12 acres of permanent pasture. This piece of lowland was considered wasteland when he moved to the farm—it stayed wet most of the time and even after a drainage ditch had been dug the land would not produce good field crops. The district conservation plan for his farm recommended that this particular piece of land be developed into a permanent pasture. Mr. Woodruff prepared the land, applied superphosphate at the rate of 400 pounds an acre, and sowed a mixture of Kobe and Korean lespedeza, Dallis grass, and white Dutch clover. Bermuda grass already was growing well on the land. Today, the pasture has a thick sod, and Mr. Woodruff regards it as the best piece of land on his farm. With better pasture for grazing and growing more hay on his farm, Mr. Woodruff now has 17 head of beef cattle. When he moved to the farm he had only 3 cows.

S. E. Statham, Sumter County farmer and chairman of the Georgia Agricultural Conservation Com-

mittee, conducted the Americus meeting and emphasized the need for farmers to use more soil-building practices as a means of keeping the farm land productive, especially in view of almost certain shortages of fertilizer and other materials.

"It's going to take a lot of food to feed our soldiers, our workers in war plants, our allies, and starving Europe after the war," Mr. Statham said. "For that reason, soil building is the patriotic thing to do, and the farmer who deliberately neglects to do this is as much a slacker as the man who dodges the draft."

Mr. Statham, also a cooperator of the Lower Chattahoochee River Soil Conservation District, is firmly convinced that the Georgia AAA program can greatly accelerate the work of the soil conservation districts in his State, especially if the AAA committeemen lend a helping hand in getting the simple practices established in advance of the more complex practices requiring technical assistance.

"You can help the Soil Conservation Service technicians in the districts to reach more farmers," Mr. Statham said at the Americus meeting, "by getting the farmers to apply the simple practices. For instance, pastures can be brushed and improved by re-seeding and fertilizing while fertilizer is still available, kudzu and trees can be set out, winter and summer cover crops can be planted, and so on. This is some of the preliminary work that can be done and needs to be done quickly.

"I urge you committeemen if you don't have district plans on your farms to get them. Then get your neighbors and other farmers interested.

"The AAA program is designed to help farmers get more conservation on the land. As you well know, there are quite a few soil-building practices that count toward earning a soil-building allowance. If the farmer is interested in establishing these practices, show him how he can qualify for AAA payments which will go a long way toward defraying the cost.

"In fact, take that farm model there. It is an actual farm in Taylor County. The farmer is a cooperator of the district and the AAA program. He used the AAA payments and spent only \$30 extra to get those conservation measures on his farm."

George Roundtree, Georgia field officer for AAA, gave a clear picture of the importance of conservation farming in time of war. He predicted that as the war goes on farming will become increasingly difficult as a result of a greater scarcity of labor and serious shortages of fertilizer, equipment, and other materials.

"We're in a war that probably will not be over soon," Mr. Roundtree said. "We are going to be



At meetings held throughout Georgia, AAA county and community committeemen studied farms and visited districts. Here W. C. Huggins, district conservationist of the Middle Western Ocmulgee soil conservation district, points to a model of a Georgia farm in need of erosion control. Just beyond is another model showing conservation measures established on the same farm.

called on for more food and feed, and we will probably be asked to meet these demands with less and less fertilizer as time goes on."

Pointing to the farm model showing the condition of the Taylor County farm before conservation farming, C. L. Veatch, district conservationist of the soil Conservation Service, showed how erosion prevents the farmer from contributing fully to the war effort. Then turning to the other farm model, Mr. Veatch removed a cover and revealed what at first looked like an entirely different farm. However, it was the same farm and for every erosion problem on the first model the solution was shown on the companion model in the form of established conservation measures.

"The use of these practices such as improved pastures, kudzu on critical slopes, terraces, strip cropping, rotations including summer and winter legumes and so on, is helping farmers produce more beef, pork, milk, and other products needed," Mr. Veatch said. "Farmers also find that by using contour cultivation, better rotations, and other practices they can grow

good crops of peanuts and soybeans with little loss of soil."

When Mr. Veatch finished his discussion the committeemen huddled more closely around the farm models and for a half hour kept up a steady flow of questions. For each question raised on the advisability of using a particular soil conservation measure on the Taylor County farm, Mr. Veatch explained in detail that the selection of the measure was based primarily on a land use problem that had to be remedied, and in developing the conservation plan with the farmer, his food, feed, and other economic requirements, including plans for the future as well, had to be considered. Mr. Veatch said no two farms are alike, and neither are their food and feed requirements alike. Therefore, he added, the detailed plan for conservation must dovetail in each individual case with the present and future requirements of the farmer.

"However, there is no need for the farmer to delay establishing the simple conservation practices before applying to the district for a complete plan," Mr. Veatch said. "He should establish all of the simple practices such as improving his pasture and use of winter and summer legumes as quickly as he can. Furthermore, his AAA soil-building assistance will largely pay the out-of-pocket cost of carrying out these practices."

The Americus meeting was one of the last to be held in the State, but all of the training meetings followed the same pattern rather closely. State AAA officials were particularly pleased with the interest the committeemen displayed in the farm models and in the farms they visited. Twenty sets of farm models that the Soil Conservation Service had built for educational meetings in districts were used at training meetings.

"The AAA in Georgia is greatly indebted to the Soil Conservation Service men who helped put the training meetings across," said T. R. Breedlove, State AAA administrative officer. "Fortunately, the district program is well advanced in Georgia and that helped us a great deal. It enabled the committeemen to visit farms cooperating with the districts and to see for themselves just how important conservation is in wartime."

The folklore of American history hands down to us no legend more full of human interest than the story of Johnny Appleseed, that benign character who left his monuments of apple trees scattered through the Ohio valley.

(Continued from p. 133)

means a big change in the way we've been doing things. It'll take time to work it all out." He stopped and waited for Mary—he could see she was ready to speak.

"There's Cousin Sue, John. She is having a tough time on that poor hill farm since Walt was killed, and Jane and Tom have so far to go to school. Their lease will be up March 1st anyhow. Remember how Walt wanted you to help them find a better farm for rent? Tom is 12 now and tries to do a man's work. With Henry leaving we'd have a good house and garden for them. I'll write Sue tomorrow, and I'll bet anything she and the children will come. It will help them, and it will help us through this emergency."

"You've said enough, Mary. We're a big day nearer winning this fight. A little planning ahead means a lot, doesn't it?"

RUNNER PEANUTS

(Continued from p. 126)

As a result of the development of this crop in the soil conservation district program, there were numerous opportunities this fall, particularly in the Wiregrass district, to collect yield data where peanuts were interplanted with blue lupine that was later harvested for seed.

In the fall of 1941, Albert Parrish of the Headland Community in Henry County, planted one-half of an 18-acre field to blue lupine, leaving spaces every 3 feet. Runner peanuts were planted in the spaces in March 1942, about 2 weeks earlier than normal planting time. The

lupine was combined for seed when the peanuts were about "half finger" high, and he harvested 6,400 pounds of lupine seed, worth 10 cents a pound, from the nine acres. This represented a return of more than \$70 an acre from the lupine seed. Several other farmers also used this method.

Although it would not be possible to obtain yield data on the peanuts until later in the fall, by early September the peanut vines where lupine seed were harvested had apparently made as much growth as on the remainder of the field where no lupine was grown. Mr. Parrish intended to plant the entire field to lupine after the peanuts were harvested this fall.

"In the past, we never gathered peanuts 2 years in succession on the same land," Mr. Parrish says. "If we planted them the second year, we hogged them off. But if we are going to get the oil we need to help win this war, we're going to have to forget about rotation for the duration. That means we are going to have to use a cover crop or ruin our land."

W. B. Oats, another farmer of the prosperous Headland Community, where land sells at around \$100 an acre, puts it more forcibly. "You just butcher the land when you take two or three crops of peanuts off, without protecting the soil," he says. "Why, if we go on planting peanuts without cover, this land won't be worth \$7 an acre."

It is to find out just how such a disaster can be avoided that the field studies now under way are being carried out on an extensive scale. Results obtained are expected to provide definite information to replace the traditional beliefs as to what can and what cannot be done, particularly with reference to cover crops, under conditions of hog and peanut production in the runner peanut section.

This information, which has become vitally important with the greatly expanded acreage of peanuts to meet war needs, will furnish a sounder conservation program in the runner peanut section after the war.

ONCE GULLIED FARM NOW MONEY MAKER

(Continued from p. 135)

in the conservation plan for his farm by the Dan River Soil Conservation District.

Naturally, Mr. and Mrs. Butler are proud of their farm, no doubt partly because they had so many obstacles to overcome at the beginning. They are a busy couple, but they always find time to show their farm to visiting farmers.

"I don't mind showing my farm to other farmers even if it does take a little time," remarked Butler. "I feel that if the conservation work I have done will help them to do a better job of farming, my time will have been well spent. And today, when we have to produce more food for our allies and ourselves, we simply must keep our land in the best shape possible and make every acre do its best."

HOW MAGAZINE DISTRICT MAINTAINS EQUIPMENT

BY HAROLD J. BUTLER¹

This plan for handling equipment was developed by the Magazine Soil Conservation District, Arkansas, as a result of experience. Maintenance of equipment owned by and loaned to the district had been a serious problem until November 1941, when the new plan was adopted by the supervisors.

The new plan has been in effect for more than six months, and because it has proved most successful it is presented here for the information of other districts with a similar problem.

Equipment granted the Magazine Soil Conservation District Supervisors consists of long-wing Kelly plows, hillside plows, fresnos, one Henkel lespeze combine, and one or two Texas terracers, numbering in all less than fifty pieces. It should be noted that this equipment is of a simple type requiring a minimum of upkeep and maintenance.

The plan, as adopted by the supervisors, carries an annual charge of \$2 payable in advance before any piece of equipment can be used on the cooperator's farm. This fee covers the use of any or all pieces of equipment available to the farmer for a period of one year only, the year ending on November 1 of each year. If the farmer performs no work or prefers not to use the district equipment, he does not pay any maintenance fee for that year. The maintenance charges are used for keeping the equipment in good working order, and if at the end of the year there is enough money left new equipment will be purchased. As it now appears several pieces of equipment will be purchased in November 1942 if it is available.

The supervisors also require that any cooperating farmer owing the district for use of equipment before November 1942 must pay up his old account before he can use the equipment again.

The equipment is repaired and maintained locally by blacksmiths and mechanics, and new parts are purchased by the supervisors, all of which is paid for each month at the time of the regular monthly meeting.

The equipment is handled by assistant supervisors in the different communities, with each assistant responsible for collections of fees and the returning of damaged or worn pieces to headquarters of the supervisors for repairs. These assistant supervisors have free use of equipment on their own farms as reimbursement for their time and the responsibility

of handling the equipment. Through the use of such assistants in each small community a minimum amount of expense is involved in transporting, hauling, and handling the different pieces. However, if one community is not making full use of the equipment, certain or all pieces are moved to a community that will make full use of it. In this way the equipment is kept at its optimum working capacity.

If every cooperating farm uses the equipment once this year, an amount equal to twice the initial cost of the equipment will be received by the district, or approximately \$1,150 in 1942.

This plan of handling equipment is self-liquidating, and very little bookkeeping is required because the books are closed each year on November 1 and a new set is started, with no old accounts and a new fee assessed to those who require use of the equipment during the next 12 months.

The main difficulties with the old plan were that the fee was not payable in advance, but was payable quarterly at the rate of 50¢ per quarter if the equipment was used during the quarter, and that the 50¢ was not enough to repair and overhaul it. Hence, nearly all users of equipment did not reimburse the district for equipment usage and no money was available for upkeep and repairs.

Up to the present, no trouble has developed from this new plan. The equipment is all in excellent working order and the farmer who uses it is assured that the next farmer must pay his share of the upkeep and repair. The equipment has been used as much or more than during any previous similar period, nor do the supervisors expect that the plan now in effect will curtail the use of district equipment. Actually more money has been received by the district for equipment usage during the six months under the new plan than in the whole three years under the old plan.

"The world does not have too much productive soil. The areas of really good land—high quality, food producing land—are limited. In terms of the population this land must support, I am not altogether sure that we are not approaching a world-wide shortage of Grade A, food producing land. Certainly the war is not helping to improve the situation with respect to soil resources."—*H. H. Bennett.*

¹ Engineer, Magazine Soil Conservation District, Arkansas.



BOOK REVIEWS AND ABSTRACTS

by Phoebe O'Neill Faris

FIELD CROPS AND LAND USE. By Joseph F. Cox and Lyman Jackson. New York and London. 1942.

About 5 years ago Cox and Jackson dedicated their "Crop Management and Soil Conservation" to the future farmers of America, thus designating the volume as a text for use by agricultural schools. This new book, built somewhat on the same plan, is more extensive and detailed in treatment and is of course pointed up to war and peace demands upon the agriculture of the nation. It is in fact dedicated to "the growing army of American farmers who plan and execute their programs of efficient crop and livestock production so as to improve the fertility of the soils in their charge, provide for the Nation's needs during times of peace and war, and assure the onward course of our country toward ever-increasing prosperity and enhanced freedom."

Thus, by the authors' intent, their new work on farming is for farmers. Since it draws together and molds into one piece the important results of our many agricultural stations, our land-grant colleges and the bureaus of our Department of Agriculture, it should serve, for some years to come, as a valuable single course for the millions of farmers and agricultural technicians who are working with grim determination to put agriculture on a sound basis for all time. To stop misuse of the soils, improve agricultural opportunities for farm people, and at the same time produce the food and other crops required by tremendously expanded war demands is no small job in a country the size of the United States. A few good books such as this can help more than a million pamphlets that carefully avoid giving the farmer and agricultural specialist any workable information.

Upward of 40 crops are treated individually as to their soil, climatic, and cultivation requirements; their effect upon the soil; their place in rotations and their regional adaptations; availability of seed; harvesting and curing and processing; nutritional, fiber, or medicinal values; their soil-conserving or soil-depleting qualities. The "corn" chapter is the most extensive of any dealing with a single crop, but the small grains, the legumes, tobacco, cotton, and the root crops are treated in a detailed fashion with special emphasis on recent experimental findings regarding best methods of production without permanent loss of soil fertility. A chapter on soybeans and field beans is especially interesting in the light of tremendous wartime expansion of this crop and several quite new discoveries which should aid greatly the soybeans-with-soil-conservation efforts of many growers. A most revealing chart is given to show the hundred or more uses to which soybeans were being put only a few years ago—it would be interesting to see this chart brought up to date by wartime values!

The whole book, almost 500 pages, is built upon the premise that with correct soil and water conserving methods, and proper crop management, American agricultural production can be maintained to meet any and all demands. A chapter on the agriculture of the Nation and the Nation's prosperity and strength should be read by farmers; it is a brief but clear statement of the effect of the war program upon our

agriculture and it should help greatly in clarifying confusion regarding the part of governmental action agencies now taking a heavy responsibility in the greatest agricultural improvement program the world has ever known.

There is a chapter on classifying crops, and here are two new classes definitely added to crops for food, fiber, pasturage, medicinal purposes, etc.—they are soil-building or soil-conserving crops as contrasted to soil-depleting crops. There are chapters on crop management for conservation; regional and subregional types of farming as related to crop adaptations; crop rotation planning; soil fertility improvement practices; plowing and cultivating under the soil-conservation system; cover and green-manure crops; pasture and meadow management for cattle and for hogs; the specialized grass-land agriculture of our great livestock producing areas; weed and insect and crop disease control; seed and seed growing and marketing; the live-at-home farm with special reference to production for improved diet; crops for wildlife, including the farm fish pond. All these chapters are "workable" chapters—they can be used as "tools" by the farmer as he plans his wartime and post-war production, and thinks far ahead into the future of a great democracy now engaged in helping to win the greatest and most terrible war of all ages.

CHRISTMAS TREE FARMING

(Continued from p. 136)

(harvest age), Mr. Abraczinskas placed it at \$50 per acre. On the basis of 2,000 to 2,500 trees per acre, he figures his net return at the end of the 8-year period at \$900 per acre.

It may interest foresters to know that for 20 years this man has been practicing control of the white pine weevil in his plantations through care and encouragement of the weevil parasite. Affected shoots are pruned, placed in barrels covered with fine screen at each end, and left scattered through the plantation. The weevils, unable to escape through the screen, die in the barrel, whereas the tiny parasites multiply and escape through the screen to carry on their work. Mr. Abraczinskas claims this practice to be very effective.

Another point of interest is that his forestry practice extends to the scientific development of valuable strains of nut trees—this on a small scale, but of sufficient value to have attracted specialists of Nation-wide fame, including J. Russell Smith of "Tree Crops" fame.

"We must resolve now to keep our industrial machine running at full blast when peace comes. If we succeed, there will be plenty of markets for full farm production here at home, as well as in the parts of the world prostrated by war. If we fail, the bottom will drop out of things, not only for the newly settled farm families, but for all other Americans as well."—*Secretary Wickard.*

For REFERENCE

Compiled by **ETTA G. ROGERS, Publications Unit**



Field offices should submit requests on Form SCS-37, in accordance with the instructions on the reverse side of the form. Others should address the office of issue.

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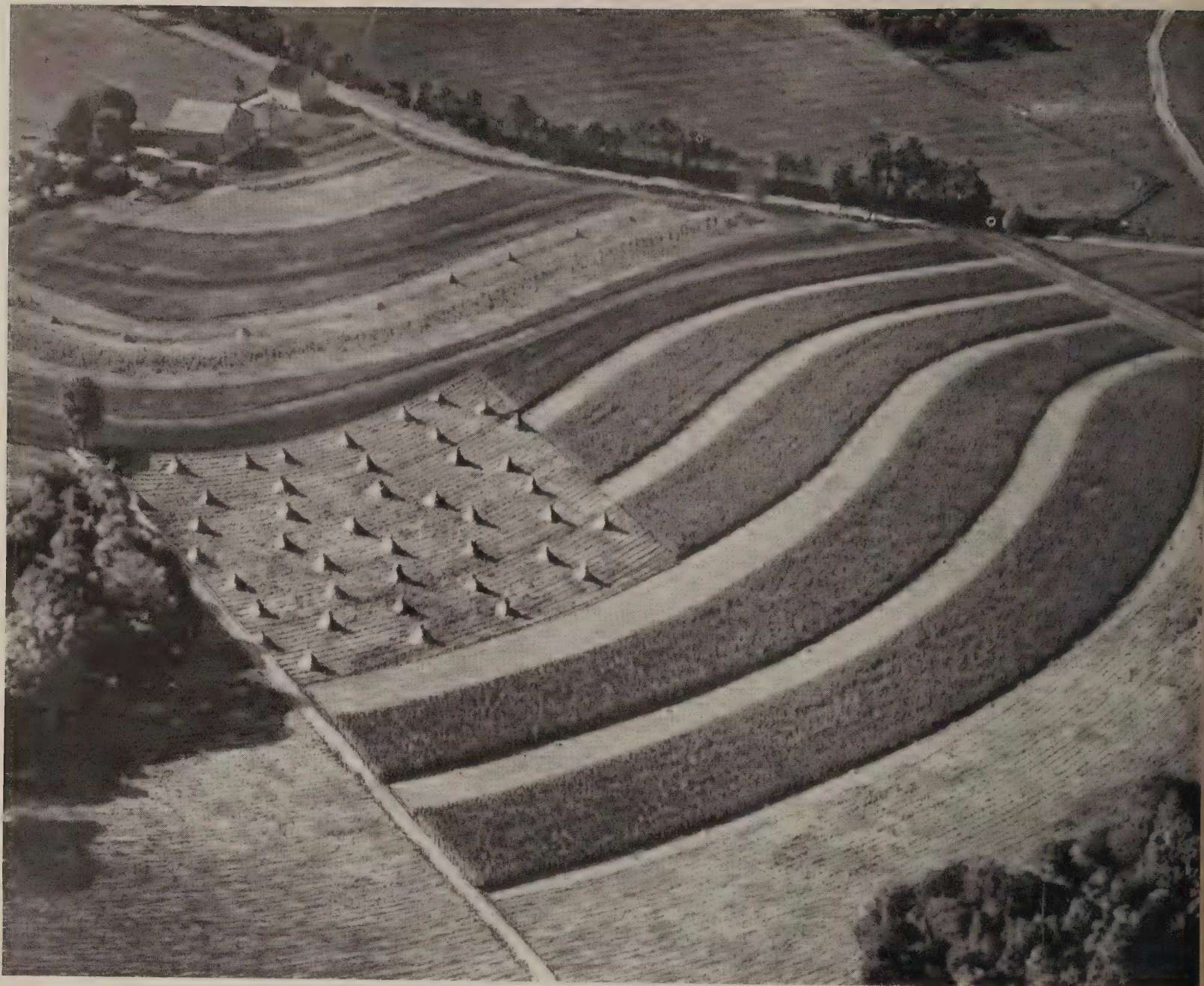
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¹ From Superintendent of Documents, U. S. Government Printing Office, Washington, D. C.



Symbolic of the conservation work of millions of farmers who are waging the battle of production, is this composite of views from Pennsylvania and Texas.

Corn shocks on the contour are the stars. The broad stripes are strip crops of corn and hay planted on the level, around the slope.

This photographic depiction of "Old Glory" is a reminder of the importance of protecting the land for the freedom of which our soldiers and sailors are fighting. Through conservation measures American farmers are also increasing yields at a time when food and fiber are as urgently needed as gunpowder.

Keep this stirring conception in mind, as you press the idea of contour farming this winter.

JANUARY 1943



SOIL CONSERVATION

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

Conservation goes to war! Sod for drill fields! Legume seed for the South! New production methods for China! These and other vital developments are told in this issue. C. R. Enlow tops it off with a pointed discussion on Production Through Conservation.

UNITED STATES DEPARTMENT OF AGRICULTURE - WASHINGTON

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WELLINGTON BRINK
EDITOR

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SOIL CONSERVATION

CLAUDE R. WICKARD
SECRETARY OF AGRICULTURE

HUGH H. BENNETT
CHIEF, SOIL CONSERVATION SERVICE

VOL. VIII • NO. 7 ISSUED MONTHLY BY THE SOIL CONSERVATION SERVICE, DEPARTMENT OF AGRICULTURE, WASHINGTON JAN. • 1943

THIRTY THOUSAND Navy recruits needed mud-free drill grounds to train for the grim business of war. That is why the Navy Department turned to the Soil Conservation Service for sod—miles of it—when construction was started on a 50-million dollar training base near Sampson, N. Y. Sod, the Navy said, was preferred to seeding or paving because it afforded the cheapest and quickest way to provide usable drill fields with minimum demand on critical materials and construction equipment.

Some 17 miles from the training station is the 13,000-acre Hector Land Utilization project, which sprawls over Seneca and Schuyler Counties. Here was sod, and plenty of it. Could the Navy have about 200 acres of sod? Yes, the Navy could; and thus, almost in less time than it takes to tell it, arrangements were made for one of the largest sod-removal operations on record.

The Service, of course, specified places from which sod could be removed—only level, unimproved portions of the project area could be used. The Navy agreed to lime, fertilize, and seed after sod was removed.

On July 11 contractors for the Navy Department started cultivating the sod sites selected by the Service. The areas were mowed and raked twice. A 10-5-10 fertilizer was applied, and some of the fescues, with Canada bluegrass, Kentucky bluegrass, orchard grass, and red top, were sown. A heavy farm roller was then used to compact the sod.

The contractors employed mass production methods when the sod was ready for cutting, lifting, and laying on the drill fields. This work started September 5 with more than 150 laborers, several standard sod cutters and between 30 and 40 trucks in action. The operation was on such a large scale that contractors erected "Navy Sod Farm" signs throughout the project area.

This is how they operated: After the sod cutters had passed, crews cut the strips into 2-foot lengths. Other crews, working in teams and using pitchforks,

SOD GOES TO WAR

BY J. M. SLOAN¹



One of the Navy sod-farm signs.

then lifted the blocks of sod to wooden trays, 4 to a tray—6,000 trays were required to maintain the pace. The trays were then stacked and loaded on flat-bed trucks, 60 to 70 making a load. Each truck made about 4 round-trips between the sod farm and the training station in 12 hours.

At the drill fields, where the ground had been prepared by disking, raking, and fertilizing, as well as mixing peat and sharp sand with the native clay, the trays were lifted from the trucks by hand. The four blocks of sod were slipped off by tilting each tray. Sod placers seldom had to move the blocks more than a few inches to get them in place. After a considerable area of sod had been placed, a top dressing of soil was applied and dragged with a light drag to fill in cracks and depressions. More seed and fertilizer were then applied.

By November 15 the contractors had completed the laying of 3,600,000 square feet of sod. The average per day was 51,500 square feet, and the maximum laid on any one day was 112,000 square feet.

¹ Chief, regional land management division, Northeast Region, Soil Conservation Service, Upper Darby, Pa.

Thus, sodding of the drill fields was practically completed in a little more than 2 months. The fields are ready for the marching feet of the 30,000 recruits who are pouring in for training. Sodding of other sections of the station will be resumed in the spring.

Aside from the sod that went to war, the Hector project has been doing its bit in another way. More than 2,700 head of livestock owned by neighboring

farmers grazed the 5,200 acres of improved and managed pastures during the season just past. Another crop that will do its bit is the 3,900-acre forest plantation in the project area—this forest will replace some of the timber now being harvested for war. Still another contribution of the multiple-use Hector project is the recreation area and picnic grounds, where people of the community can enjoy those days in the open that are so important to a people at war.

Cutting the sod in strips.



PRODUCTION THROUGH CONSERVATION

By C. R. ENLOW¹

WITH customary American impatience, many sincere, optimistic individuals are seeking methods whereby conservation practices that will increase crop production may be applied overnight to the farm lands of the country. Their efforts are to be commended; but it seems advisable to point out a few dangers that lie ahead, not with the idea of discouraging such worth-while efforts, but in hope some pitfalls may be avoided.

ANYONE working in soil conservation for the past few years must appreciate that the control of erosion is a tough, long-time job. It is impossible to control it without getting at the source of erosion, which goes back to land use. If it isn't a tough job, why have we succeeded in developing erosion control treatment for only 130,000 farms since 1933?

¹ Chief, agronomy division, Soil Conservation Service, Washington, D. C.

RECENT instructions have gone out from Washington, urging Soil Conservation Service personnel to take a very active part in assisting with the widespread application of conservation practices, because it has been proved beyond a doubt that conservation practices do increase production. The production goals must be met, and if we have information that will help increase production, and do not make our contribution, we deserve severe criticism. In other words, we must take on two jobs: We must continue our present efforts to make a sound approach toward securing conservation on as many farms as possible, and in addition, try to get the widespread use of practices that will increase production to meet the present urgent demand for more food. In the latter, it is rather comforting to know that the men who are working directly with farmers are trying to warn Washington that such a procedure is dangerous. It is also

dangerous to face the Japs and Huns on the firing line. But we must do our job, and it is gratifying to realize that the dangers are recognized. We are relying on the intelligence of experienced personnel to avoid all possible dangers and yet help accomplish the immediate objective—to win the war.

IN this country, we find an endless combination of factors that are responsible for erosion: those beyond the control of man, i. e., rainfall, soil variation, and topography of the land; and those under man's control, as tillage practices and the many phases of crop and livestock production. There are endless combinations and variations of the factors, all of which are reflected in varying methods of erosion control. Control measures in erosion depend entirely on local conditions and problems, hence, become rather definitely a local proposition. It is only the principles of erosion control that can be approached from a national basis.

ASSUMING for the moment that it is possible to pass over the diagnosis of the farm—in order to arrive at proper land use and to develop a water disposal system for the farm—let's see what we might accomplish by recommending one "single" practice to be applied, nation-wide, to farms and fields as they exist at present. Contour farming—plowing, planting, and cultivating on the contour—is regarded by most everyone as relatively simple. It is not difficult to run contour lines, after a few minutes' instruction, and operating machinery on the contour involves no difficulties unless the land is particularly steep in which case it probably shouldn't be cultivated at all.

REPORTS have come in from all over the country citing increased yields of crops from contour planting—wheat from the Great Plains, corn in the Corn Belt, beans in the Southwest—practically everywhere yields of crops have gone up as a result of the practice. On the basis of these reports, why not go all-out for contour farming? If it will conserve soil and increase crop yields, what more can we ask? Suppose we look about the country just a bit to check on the facts concerning contour farming.

IN the Southeastern States, contour farming is a rather general practice, and in many localities it is the exception to find a field with rows of cotton or corn running up and down the slope. But one thing becomes evident almost immediately—one seldom sees contour planting *except on terraced land*. An

occasional small field, or narrow field, may be observed that is contoured, without terraces, but any appreciable acreage so treated is not evident.

IN the Northeastern States, contour farming has spread rapidly in recent years. Here we observe a rather limited acreage under terraces, but with the contouring we find extensive strip cropping. Farmers were growing crops in strips, on the approximate contour, in West Virginia, New York, Wisconsin, Pennsylvania, and other States many years ago. But an entire field, planted on the contour to one crop was seldom seen, nor is it to be seen now.

VERY little contour planting was done in the Corn Belt previous to the present conservation program, and the present contour planting is nearly all associated with strip cropping or terracing. In the Far West, considerable "across the slope" farming is found on steep slopes, as in the Palouse country and the California hills, largely because it is impossible to operate machinery up and down the hills. Farmers there are much interested in "mulch" farming—keeping the crop residue on the surface to help prevent soil washing during the fallow season. In the Great Plains contouring has been quite successful, but farmers are intensely interested in mulch farming, and in wind erosion areas strip cropping occurs extensively. In other words, there are no extensive areas in the country where contour tillage is used alone. Why?

SEVERAL years ago, I was on a farm in the loessial soil area of eastern Nebraska with J. N. Lowe, who was at that time Acting Regional Agronomist at Salina, Kans. We had been arguing about contour farming, and Lowe took me to the farm to settle the argument. It did. The farmer had been growing corn up and down the hill, and Soil Conservation Service employees had convinced him he should put his rows across the slope, to prevent soil loss. Gullies several inches deep were formed between the corn rows each year, and the farmer realized he was losing soil. So he agreed to try contouring, and planted across the slope, as nearly on the contour as possible. The result was the elimination of small gullies—but instead 8 or 10 large ones, waist deep, were evident. Water had followed the contour rows to the first depression, had broken over, accumulated in ever-increasing amount as it received the contribution of water from each contour furrow it passed, until it became a raging torrent, carrying tons and tons of soil directly down the slope.

CONTOUR tillage, as a *single* practice, might have been all right, if we had started using it when the sod was first broken years ago. But on most fields today, there is a definite erosion pattern already established—many depressions that make it impossible to work on the exact contour with machinery and prevent water accumulating and breaking down the slopes. Sod strips as in strip cropping, terraces, or something to prevent the continued accumulation

of water is necessary if contouring is to be successful. Otherwise serious and irreparable damage to the land is almost certain to result.

AND so it goes. There is no “simple” practice or “single” practice that is safe to recommend without qualification. Terracing must have its protected outlets and supporting agronomic practices; cover crops must be considered from the standpoint of

(Continued on page 156)

This picture illustrates how water concentrates in depressions where rows of potatoes cannot be kept on exact contour. Result, the beginning of serious gullies.



NOW CHINA PREPARES FOR INCREASED PRODUCTION THROUGH SOIL CONSERVATION

BY W. C. LOWDERMILK¹

I

IT is with deep satisfaction that I leave again for China—this time to help that great people set up a Soil Conservation Service, to bring to the most populous nation of the earth the benefit of our experience in applying measures of soil conservation to the land under the inspiring leadership of Hugh Bennett. The Chinese have established the most enduring civilization of the earth, a civilization which merits our study as we work out ways and means to adapt and apply the secrets of longevity to our own social structure. Thus while we shall have certain technical contributions to make to China, we shall also have much to learn from this so great a people.

The fact that we are able at this time to contribute our movement for soil conservation to other

countries is remarkable. It is a fine new thing—a hope of the future—that out of a philosophy of inexhaustible resources we should have developed a philosophy of conservation within so brief a space of time. It is the prophetic spirit that abides in a healthy social organism, and it is this foresight that may be imparted to other countries and must needs be adopted by peoples of the world after the bloody business of this war is over, if we are to do any better than we have done up to this date after 7,000 years of civilization.

Land is the common denominator in international relations. When our dealings between nations are put in terms of the land as a means of production, as of greater importance than the products that have been separated from the land, then we shall get down to bedrock in working out the reconstruction of the world, in the interest of the common

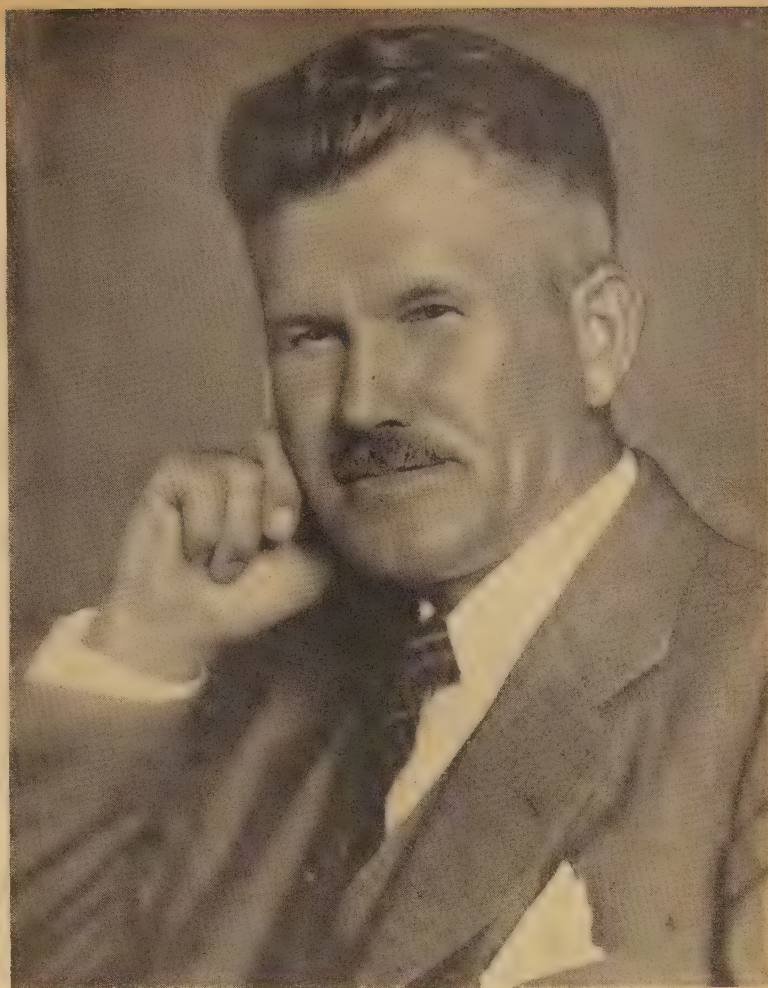
¹ Assistant Chief, Soil Conservation Service, Washington, D. C.

man and of mankind. Besides, the land is seen and felt. What we do with the land is plain to see and to read—a farmer, a nation, a civilization, writes a record indelibly upon the land. Measures of conservation worked into the land are understood by all; their significance may be perceived by the wise and the foolish. How much more significant are these works than words, generalities, however plausible. Work on the land has a meaning beyond the next harvest, beyond the farm boundary. It shows forth the intentions of a people. We, as a people, express our will to live through our treatment of the land as surely as we fight on the battlefield.

Back to China where the everlasting significance of soil erosion was burned into my consciousness . . . It was while making agricultural explorations in the vast loessial region of northern China that I was made to realize that soil erosion will undermine a civilization and is more effective than adverse change of climate in reducing the carrying capacity of land for a people and its civilization. Mere descriptions with speculative conclusions were not enough; I knew that we must measure effects of erosion to know what is going on within a nation and to judge how great a menace it is to sustained use of the land. This I did in China, as was reported in 1924, 1925, and 1926.

II

HUGH BENNETT and I came to this problem of erosion from different directions. He, our Chief, descended from a long line of able farmers, took up the science and practice of soil surveys nearly 20 years ago. He early showed a remarkable ability to perceive the operation of natural forces, to draw conclusions from his field observations, even though these conclusions were at variance with the accepted opinions of the times. He lived so closely with the fields and woods that he discovered that conditions on the land were not static, but were changing and, more, that single cropping, plowing up and down slopes, and other abusive farm practices were setting in motion the forces of soil erosion which were changing the face of the landscape and undermining the very base of a lasting and prosperous agriculture. Even more, he saw that these wasteful practices were undermining the basis of a civilization in this new land where it was the style to consider natural resources as limitless and inexhaustible. It was a trait of genius that led Hugh Bennett to discover and proclaim the warning of a deadly menace in the midst of our self-complacency and unbounded optimism. This partakes of the prophetic element in a healthy society.



Dr. Walter C. Lowdermilk.

EDITOR'S NOTE.—*An unusually able American, Dr. W. C. Lowdermilk, has spent his lifetime as a citizen and scientist of the world. Today, as a representative of the United States, he is in China—a land that respects learning above nearly all else.*

Dr. Lowdermilk's latest assignment is to help produce more food for fighting millions and to help make secure the soils of an old but constantly living China.

Dr. Lowdermilk knows the lands and the people of China. He knows also the lands and the people of the United States, of Europe, of North Africa, of Egypt, of the near East. He knows languages. He knows how to work with his hands. Most important, he knows the uses of science, patience, and planning. Patience and planning in the present Chinese situation must, in turn, entail courage and vision—and Dr. Lowdermilk's record reflects both of these qualities in generous measure.

In spite of ridicule—some said he was a “half-baked enthusiast”—Hugh Bennett persisted and called for actual measurement of erosion. He had to wait many long years before this opportunity finally came, when a Congressman of Texas, James P. Buchanan, with a rare sense of foresight and

statesmanship, called for a congressional hearing on soil erosion in 1928, which gave rise to the first congressional appropriation for a study of soil erosion on our farm lands. Presenting his request for supporting funds in the form of an amendment to the Agricultural Appropriation Bill, Congressman Buchanan's proposal was accepted without a dissenting vote. Hugh Bennett, who had presented the technical evidence at this hearing, soon thereafter established 10 erosion stations in critical problem areas of the United States and began the measurement of waste of soil by accelerated erosion and loss of rain waters by surface runoff.

As for myself, I first came to a realization of the significance of erosion in 1914 as a forest ranger in Arizona where overgrazing of forest ranges was prevalent in my ranger district of Tonto National Forest. I had been trained as a geologist as well as forester, so the complaints of "old timers," the pioneer stockmen of Arizona, that the grass was no longer as high or as heavy as it was in the early days, and that the former small clear streams had become great wide stony and dry washes, made a great impression on me. Thus it was that we began field observations and a study of erosion as it was affected by the condition of the land.

By this time, other observers, especially among geologists, had reported their observations on erosion—Leonidas Glenn, Salisbury, Van Hise, Nathaniel Shaler. The subject was receiving academic interest, but nothing was being done about it. Importance of the problem was recognized where the observer had the faculty to perceive the long-range operation of natural processes, as of interest in forecasting what such a process at work in a landscape would accomplish in 10, 20, 50, or 100 years. Thus far, however, conclusions by such observers were speculative for they were not based on measurements. There was no mathematical way to forecast the end result of accelerated soil erosion.

Then after serving 2 years with the Engineers of the A. E. F. in World War I, I went to China in 1922 on a project of the University of Nanking for famine prevention. I made regional surveys or explorations in that part of China where the famine hazard is high—the area which had been ravaged only a short time before by the great famine of North China of 1920–21.

In the course of the first survey, we visited the site of the great break of the Yellow River dykes in 1852. As we traveled over the vast Yellow River Delta plain, in time we saw looming up out of the haze a long flat-topped hill from horizon to horizon. This peculiar flat hill seemed to grow in height as we approached nearer and nearer. Finally, we

climbed up the slopes to the top, some 60 or 70 feet above the river plain. Our view was amazing. Here was another vast plain fully 50 feet above the one we had just left and 10 to 20 feet below the crest of our flat-topped hill that stretched in a straight line from horizon to horizon. This was the outer dyke of the Yellow River.

We traveled on over the uplifted plain toward the horizon at right angles to the dyke. In a distance of 8 miles we came to another dyke about 20 feet high. When we mounted it, lo! we looked upon the Yellow River, China's Sorrow, a broad stream of brown water marked by many shoals and sand bars. As the cold autumn wind tugged at our clothes, we contemplated this remarkable scene, for the Yellow River had been lifted up by these dykes 50 or 60 feet above its delta plain. As we pondered the astounding achievement, I was overwhelmed in trying to imagine how millions of Chinese farmers, without machines, with their bare hands almost, had kept the mighty Yellow River in its ever-rising bed for 600 years over a distance of 400 miles. What an amazing amount of work had gone into this gigantic task by nameless heroes of flood control!

But why should millions of farmers have to do all this? Silt, silt, silt! It was deposition of silt in the river channel that each year made the capacity of the channel less, so that the inner and outer dykes had to be raised a corresponding height to prevent overflow and break of the dykes during high water. Silt may be rock floor that is ground up by boulders and gravel in a stream channel under the action of flowing water, and silt may also be soil particles washed into a stream by soil erosion. Whence such silt as we saw in the waters of China's Sorrow?

Thereupon, it was my determination to find out where this silt came from that had been the occasion of so much human labor and sorrow and tears through the centuries.

The next field trip was made for this purpose in a joint exploration by O. J. Todd, Chief Engineer of the International Famine Relief Commission, and myself. We found in the Province of Shensi in the valley of the Wei River, the largest tributary of the Yellow River, evidences of an irrigation project that, according to record, was begun in 247 B. C. We examined the site of the intake of the original canal, but then the river was 60 feet below the intake—showing how the stream had excavated its channel in the past 2,000 years. From time to time the annual intake had been pushed upstream.

It was a fascinating study of an irrigation system that was out of use because of silt. Silt again

showed its baneful effects on the works of man, by choking up canals. It had been necessary to clean out the canals, month after month, until mounting silt banks on each side made more and more work to keep the canals free of the deposits, until finally the task was too great. The canal was abandoned, other canals were dug, and they in turn were abandoned until the project fell into disuse except for a much reduced area that was irrigated with clear spring water.

Prosperity, the support of the center of the Golden Age of China, was gone, and this region that had been the most populous and powerful of China fell into decline because of silt.

Again, whence came this silt? In our search for the source of this water-borne material, we went back into the drainage area, where we found the landscape riddled with great gullies that had cut into the loess mantle. We estimated that some of these erosion ravines were 600 feet deep.

It was in these uplands that we made a great discovery. Here in the midst of labyrinthian gullies were temple forests, like emeralds, set in yellow-brown landscapes.

A detailed study of a number of these temple forests revealed that no erosion of the soil was taking place within the protected forests. It was plain that the present climate would support a complete cover of vegetation, such a cover as would prevent the kind of washing of the land we noted on all sides. Here was evidence that the wasting process of erosion had damaged the land enough to account for the decline of this region without an adverse change of climate; the temple forests themselves were proof that the present climate would support a generous growth of protective vegetation. In other words, it was not necessary to invoke adverse climatic change to account for the decline of North China.

It was then I knew that soil erosion, unless controlled, can undermine a civilization. Here then was the process of erosion accelerated above the geologic norm, and I knew also that for proper evaluation it was necessary to measure it experimentally to determine what effect different types of soil cover would have on erosion and runoff. Thus from this time, 1923, I began a series of experimental studies of soil erosion, as are hitherto reported.

III

UPON my return to the United States in 1927, these experimental studies of soil erosion were continued under the United States Forest Service, and

in 1933 I was called to Washington to assist Hugh Bennett in organizing the movement for land conservation in the United States. The basic principle of the new movement was, in the words of Hugh Bennett, "to treat the land in accordance with its needs and adaptabilities."

This was a new thing in agriculture. For, with the exception of three of them, the State Experiment Stations had completely ignored the significance of soil erosion, with disastrous effects on the validity of many fertilizer experiments. Strange indeed it was that a fertilizer experiment of 30 well-arranged plots should be observed and studied for 40 years by soil scientists without discovering that soil had been eroded off as much as 12 inches from some of the plots and filled in on others—sufficient to invalidate the entire experiment. Little wonder that farmers were unable to explain the occurrence of "clay galls" in their fields, or why dark soil "changed" to light-colored soil.

To treat the land in such way as to safeguard the physical integrity of the resource was, therefore, something new in American agriculture, and to do so in accord with scientific experiments was something new in civilization. To conserve soil by this approach is as significant in the history of agriculture as the invention of the plow. It is an outstanding advance in the march of civilization, and its significance will not be fully appraised for generations. It is too big, too tremendous, a fact to be fully comprehended by the country now, or by professional agriculturists in general.

Soil conservation, as worked in the land, is an expression of a people to survive; it is the mark of a virile people who put science to work in the common things of life for its own survival.

A thought that I cannot drive from my reflections about the agricultural lands of the world is that across the ages human beings everywhere have been prone to exploit productive land. From earliest time the soil has been mined for the last ounce of productive value exchangeable for what we have called wealth—wealth expressed in terms of money.

After decades of study of the land and what people have done to the land over wide areas of the world—the United States, Europe, much of Africa, and a large part of Asia—I have learned that man has been his own worst enemy. From continent to continent he has done far more to impoverish and waste his base of productive soil than he has ever done to conserve it. He has stripped the forests from the hills and the grasses from the prairies, and with his plows has laid bare the fragile soil to the wrath of driving wind and tearing torrents of rain.

Today, not much is left anywhere on earth in the way of virgin soil. A few isolated areas of some importance occur here and there, such as the untouched lands of the Amazon and Orinoco Basins and scattered undrained swamplands. The frontiers of the world have been very largely annihilated.

World War II struck me in Syria, where I had about completed a survey of that ancient country of the Near East, known as the Cradle of the Human Race, along with the old, old lands of northern Africa.

There I found hundreds of thousands of acres of agricultural land that once had contributed to the support of powerful civilizations stripped of its productive soil, often to bedrock. The land was gone and with it the people and the civilizations the land had supported. One area, typical of many, my memory retains vividly. I called it the Graveyard of a Hundred Cities. From this bleak, skeletonized area of approximately 1,150,000 acres, little is left but rocks and ruined cities, some of them buried with the soil that once supported them. Their very names are lost in the debris of wasted land, vanished people, departed civilizations.

In many places I found the remains of ancient structures, as rock-walled terraces that were built to save soil and to catch the rains for the benefit of agriculture. These remind us of man's defeats by man—of his raids and wars and exploitation that brought neglect and debauchery to his good land.

IV

BETWEEN my first trip to China in 1922 and this one, I have had the outright good fortune to be closely associated with the great movement in the conservation of soil which has developed in the United States pretty largely within a single decade. This vast program of land defense and repair was started by the Soil Conservation Service of the United States Department of Agriculture. It began as the Soil Erosion Service in the Department of the Interior, and by act of Congress was transferred to the Department of Agriculture when the first soil Conservation Act—Public No. 46—was adopted in 1935.

This program, today far-reaching, followed years of pleading by a few specialists that something be done to preserve the base of our American agriculture. The pleading proceeded across decades before the lawmakers were convinced that something needed to be done. It was pointed out that a permanent agriculture could not be maintained without permanently productive soil, and that millions of

acres had been ruined—and the damage proceeding at an accelerating rate.

Erosion experiment stations were established. The findings of research, covering more than a hundred thousand measurements of soil and water losses from various kinds of land used for many purposes, showed at once that the estimates of those who had been shouting in the wilderness were too small.

When the Soil Conservation Service began to operate its program of erosion control and prevention, of water conservation, and good land use, it most fortunately based its program on physical laws that were just as substantial as the fact that water will not run uphill.

This fundamental concept of the Service—Hugh Bennett's idea, and probably the greatest contribution of all time to agriculture—was that erosion could be controlled only by treating the various kinds of land according to their individual capabilities and adaptabilities. This kind of program obviously called for the use of many different kinds of practical farm measures, used singly and in combination. Such treatment of the land was a coordination of the skills of various specialists, such as erosion specialists, agronomists, agricultural engineers, foresters, range managers, and biologists.

Moreover, the land was treated on a physiographic or drainage area basis—for running water is no respecter of persons or property lines. To control erosion and unabsorbed storm waters successfully, experience has shown that measures must be planned on a drainage basis, so that farms lower down on slopes are protected from erosion waste and runoff from farms higher on the slope.

The program in the main proved successful from the very beginning. The demand for more and more soil conservation came from every part of the nation—and from Puerto Rico and Hawaii. Specialists from most of the countries of the world have visited the United States to study the program of the Soil Conservation Service. Many other nations—in Africa, in Mexico, in South America, in Australia—have set up Soil Conservation Services or similar organizations of their own.

In the United States, 2 million farmers on their own initiative have established, under State acts, 785 soil-conservation districts in 42 States, comprising approximately 460 million acres of land.

To my mind, the Soil Conservation Service has brought into being the most significant movement in agriculture in the Christian era. I am convinced that those who study this program and its accomplishments will agree with me.

LEGUME SEED AND CONSERVATION FARMING

By J. N. LOWE¹

GREAT things are seldom accomplished by a stroke of the pen. Those who live below the corn-bread and "pot likker" line well know that the best corn meal that can be had is produced by the old-fashioned water mills that slowly but surely grind "each turn" of corn. So it is with nature and changing the habits of people.

Southern farmers for generations have depended upon buying the seed of soil-improving crops from commercial sources. In fact, until recently it was considered impractical, if not impossible, to produce and harvest seed of several winter legumes and the seed of such pasture legumes as white Dutch clover in the Southeast. But the mills of time are grinding away and the change from the "seed buying" habit



Harvesting lespedeza seed with a simple combine attachment on farm without power equipment.

to one of "seed producing" is steadily becoming more apparent.

Agronomists of the Soil Conservation Service recognized in the beginning of their work that a plentiful supply of locally produced seed was essential to a sound soil conservation program. They realized that a conservation program could be no stronger than the seed production program on which it was based.

Many times farmers were not financially able to purchase the necessary seed and even when the funds were available through the AAA, as they were in 1941 in Alabama, the seed was not available at a reasonable price and many times not at all. Often when seed was available, delivery was delayed beyond the most desirable planting dates.

Even in the days of the old Soil Conservation Service erosion-control demonstration projects and SCS-CCC projects, "Establish a seed patch and produce the seed you need at home" was the slogan



Harvesting 45 pounds per acre of white Dutch clover seed from windrows in pasture, with a combine. A byproduct that often exceeds the grazing value.

of technicians and cooperating farmers alike. Organization by farmers of soil conservation districts to solve their conservation problems has stimulated further interest in the local production of seed.

The Holmes County Soil Conservation District in Mississippi is one of the best examples of how the district organization has helped farmers to produce and save their seed on the farm. In 1941 the farmers with whom the district was cooperating produced 108,200 pounds of annual lespedeza seed, 637,700 pounds of winter legume seed, and 22,600 pounds of white Dutch clover seed. Progress in seed production can be better understood when it is further explained that these same farmers in 1937-38 saved no seed of these crops. Since then they have established 197 seed patches from which legume and grass seed was harvested in 1942.

In 1939, with the help of the SCS-CCC camp at Dothan, Ala., the Wiregrass Soil Conservation District was furnished 250 pounds of blue lupine seed



Where there's a will, there's a way. Lack of equipment did not prevent this farmer from saving crimson clover seed from a 1-acre seed patch.

¹ Zone technician, Southeastern Region, Soil Conservation Service, Spartanburg, S. C. (Mr. Lowe was formerly Assistant Chief of the Regional Agronomy Division. The work reported in this article was done while he was serving in that capacity.)

for establishing seed patches. From this small beginning the cooperating farmers harvested more than 1,500,000 pounds of blue lupine seed in 1942. This seed will contribute materially to the protection of the soil and the nitrogen supply so urgently needed for normal crop production as well as increased production in the war program.

Secretary Wickard said, "The farm programs that were a peacetime blessing are a wartime Godsend." This certainly expresses the feeling of the farmers who are participating in the soil conservation district seed-production program. Farmers generally are beginning to realize the seriousness of the nitrogen shortage and that their only hope is to turn to legume nitrogen. Farmers who are working with the districts have laid the groundwork for such an emergency.

In Mississippi and Alabama, farmers cooperating with soil conservation districts in 1941 harvested from their seed patches more than 5,701,000 pounds of seed. This included 1,942,296 pounds of annual lespedeza, 410,000 pounds of crimson clover, 167,000 pounds of blue lupine, 842,000 pounds of bur-clover, 37,250 pounds of red clover, 278,246 pounds of white Dutch clover, 110,000 pounds of crotalaria, 1,090,469 pounds of pasture grass, 235,325 pounds of sericea lespedeza, and 588,400 pounds of other legume and grass seeds essential to conservation farming.

The widespread recognition of seed patches as an essential part of a conservation farming program represents a major advance in Southern agriculture. The introduction of the all-crop harvester (small combine) has established the seed-production habit as an institution in many soil conservation districts.

PRODUCTION THROUGH CONSERVATION

(Continued from page 150)

crop adaptation, seed production, inoculation of seed, abundance of soil organic-matter and plant food, and many other angles; strip cropping must be considered from the farm organization standpoint as well as from the angles enumerated under cover crops. How can a "single practice" be expected to control erosion when so many factors—farming practices, field arrangement, soil fertility, climate, soil texture, etc.—all combine to produce erosion?

IT is my opinion that any attempt to control erosion should first be considered from the standpoint of proper land use. Field rearrangement for proper land use—which is the basic purpose of land use capabilities—and the water-disposal system, are the two essentials in any erosion-control program. The crop rotation, and simple or "annual" practices can then be built on a sound framework. The wholesale use of so-called simple practices, without first doing the basic reorganization work, is merely postponing the real job. It's possible to keep on driving an automobile with a bent frame if there is plenty of money to keep on buying tires, but to get real service from the car and the tires, the most satisfactory and economical procedure is to correct the real cause of the trouble—the bent frame.

LET us go all-out for increased production and assist in all possible ways to meet the production goals; but let us not forget that the application of single practices may be only a stop-gap, pointed

toward increasing immediate production; that wholesale advocating of simple practices is beset with danger; and that we cannot afford to lose sight of the fundamentals in erosion control.

BETTER SOIL—MORE MEAT AND MILK

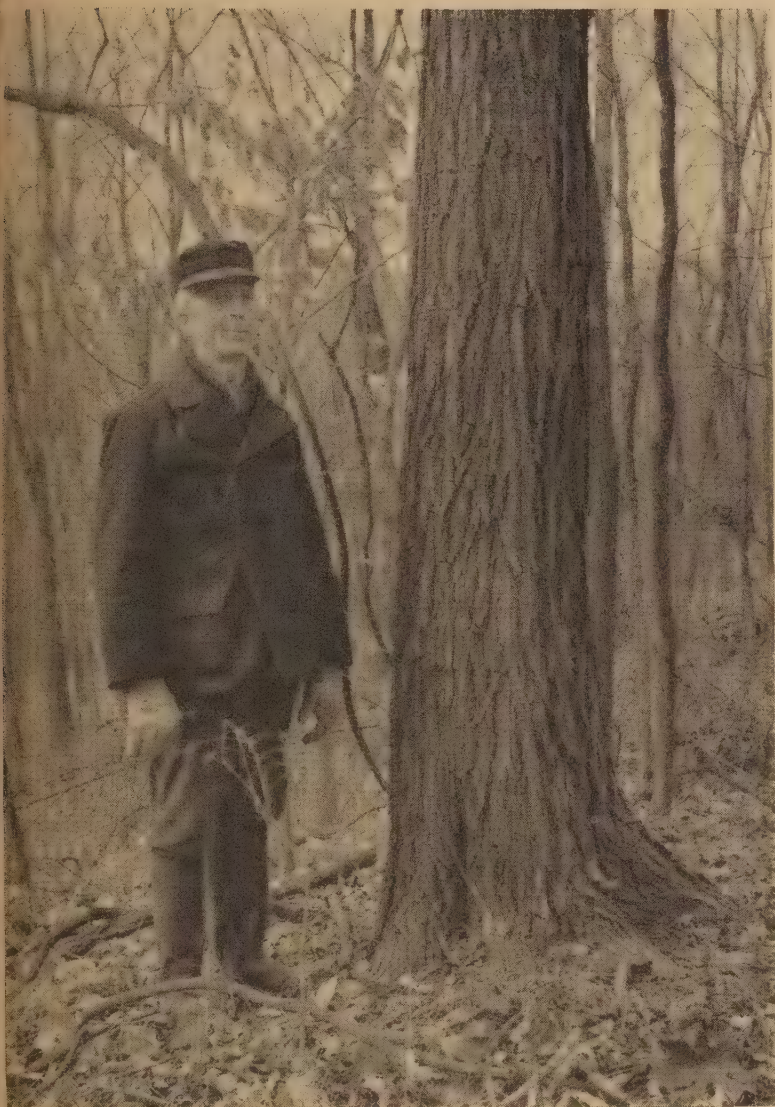
A STUDY of the production records of cooperators and noncooperators in the work of the Soil Conservation Service in southwestern Iowa and northwestern Missouri was made recently. It shows that farms using a good crop rotation, including grasses and legumes and other soil-conserving practices, produce more feed per acre and market more livestock per acre than ordinary farms.

According to this study, there was not much difference in the yield of corn and oats. The yields of hay on the livestock per acre than ordinary farms. per acre, while hay on the farms of noncooperators averaged 1.6 tons per acre. Bringing grain and hay together the cooperating farms averaged 2,884 feed units per 100 acres, while the noncooperating farms averaged only 2,704 units per 100 acres.

The cooperating farmers marketed \$169.50 worth of livestock for each \$100 worth of feed. The noncooperating farmers averaged only \$149 for each \$100 worth of feed produced. Part of this difference may have been due to more efficient management, but most of it was probably due to the fact that the soil-conserving farmers had more roughage of higher quality, according to Dr. A. C. Bunce, of Iowa State College. A more detailed account of this study was published in the *Iowa Farm Economist*, Vol. VIII, No. 3, March 1942.—A. T. Semple.

BLACK LOCUST FOR GOOD LAND USE AND PROFIT

BY J. A. GIBBS AND J. C. CRAIG¹



A specimen black locust tree in the 1904-06 planting.

MORTON T. ELLIOTT, who owns and operates a 638-acre farm near New Harmony, Ind., has planted black locust trees since 1895. He has found that the locusts not only do a good job of establishing cover, but also produce a profitable crop of posts.

Mr. Elliott plants locust chiefly to make use of short, steep breaks that occur on otherwise gently rolling land. Years ago his father advised him to "grow valuable timber" on lands too steep to farm. Thus it was that in March 1895, with a team and wagon and a man to help him, he went to an old "Rappite" cemetery and grubbed a wagon load of black locust root sprouts and planted them on one of his steep breaks. He relates today that as he and his man were driving home with the first load of sprouts, a neighbor inquired what they were doing. After hearing Mr. Elliott's explanation the neighbor laughingly remarked,

"You'll be dead before those sprouts ever make posts." This first planting has yielded two good crops—one of hundreds of posts cut in 1918, and another crop now on the ground ready to cut.

He secured more sprouts from the same source in the spring of 1898, and then in 1904 made his largest planting of over 7 acres, this time using 7,600 seedlings purchased from the Kansas State Agricultural College. He replanted 1,000 seedlings in 1904 and 400 more in 1906 in this 7-acre planting. Other plantings were made in 1916 and 1920. His next planting, in 1930, just about completed his use of seedlings, for he has found that with locust established where needed on his farm he can reproduce the stands successfully from sprouts.

The lands that Mr. Elliott is using for black locust occur mostly in the form of long, narrow, steep strips not over 50 to 60 feet wide, and varying in size from a part of an acre to over 7 acres. Slopes vary from 15 to 40 percent and represent practically all exposures. The soils, developed from deep calcareous loess, include both silt loams and sandy loams of the Princeton series. Throughout the decades sheet and gully erosion had taken quite a heavy toll of soil.

The native cover of these sites prior to planting consisted chiefly of native grasses, weeds, shrubs, and lone trees of sufficient density in most cases to require some cleaning of the site prior to planting. No other site preparation operations, such as plowing, were applied. Aside from the first two plantings, when root sprouts were used, 1-year-old seedlings have been the rule. Mr. Elliott said he has learned that better results can be obtained by using large, sturdy plants. Stock has cost about \$3 per thousand.

In the main, the method of planting has involved the use of a common crowbar and planting dibble, with no scalping in advance of planting. The number of trees planted per farm day has averaged about 500 at an average cost of about \$1.50, using a 6- by 6-foot spacing.

Following the planting on his many areas Mr. Elliott has faithfully practiced prompt replanting when necessary and has released from competing vegetation practically all his plantations during the first 2 years after planting. This release cutting has cost about \$3 per acre. As a general rule, his plantings are not fenced against livestock, because this would require an excessive amount of fence for small, narrow areas. Therefore, most of his plantations have been grazed periodically along with adjacent fields in his crop rotations. Mr. Elliott admitted, however, that he could get better growth with complete protection from livestock. No fires have ever occurred in any of his plantings.

¹ The authors are, chief, regional forestry division, Dayton, Ohio, and district conservationist, Soil Conservation Service, Evansville, Ind.

In establishing all his plantations Mr. Elliott has made use of his own farm labor, mostly at times when field work was not urgent. He hires full-time year-round labor and is interested in providing work for them during slack seasons. He has found that the various steps involved in establishing and releasing plantations, and cutting and hauling the posts, are effective and profitable labor outlets, particularly during the winter months.

The various approximate costs involved in the Elliott black locust plantings, based upon the purchase of trees and the use of home labor, are outlined below.

	<i>Cost per acre</i>
Stock -----	\$3.00
Planting -----	3.30
Releasing -----	3.00
Cleaning -----	8.00
	17.30

In addition to these initial casts Mr. Elliott figures he has an annual cost of about \$1 per acre for taxes, maintenance, and interest. This makes the total cost over a 20-year period, assuming this to be the time required to produce a crop of posts, of about \$37.50 per acre.

The results of the plantings are shown in the following table which was prepared after a study by the authors, assisted by Mr. Elliott.

In making the study to obtain the data in the above table, plot estimating was employed. Because of the small area of most plantings, the plots were usually a large percentage of the total area of the plantation. The diameter of all trees was measured with a diameter tape, and heights were taken with an abney hand level. Mr. Elliott provided the estimate of the number of posts in each tree on the plots.

It will be noted in reviewing the preceding table that the two earliest plantations were clean-cut for posts. In the other plantings, only occasional trees have been removed on a light selection basis. Unfortunately, no record is available of these latter cuttings and the table does not include the posts that have been removed from the 1904 to 1930 plantings. It is also impossible to present a figure on the amount

of fuel wood that was obtained from the tops of trees cut. Thus the figures presented in the table constitute a conservative summary of the total production of wood per acre.

In all post harvesting and selling operations Mr. Elliott has rigidly adhered to the practice of doing his own cutting with his own farm labor. All posts sold have been cut and hauled to a "post yard" near the barnyard and here they are graded and piled in neat crisscross piles. Farmers have been coming to this post yard for over 20 years to buy posts. Incidentally, Mr. Elliott expressed the thought that good merchandising principles apply to selling posts as well as to any other product of the farm.

Elliott's average total cost over many years of cutting and splitting has been about 3 cents per post, and about 1 cent per post for hauling, grading, and piling in his post yard ready for sale. His grading scheme has been about as follows:

1. Line posts :
 - a. Length, 7 feet.
 - b. Round, 3 grades, (1), (2), and (3).
 - (1) 4- to 5-inch top.
 - (2) 3- to 4-inch top.
 - (3) Less than 3-inch top.
 - c. Split : 2 grades, (1) and (2), depending upon quality, both with not less than 4-inch face :
 - (1) Firsts.
 - (2) Seconds.
2. Corner posts (mostly round and including chiefly those posts difficult to split) :
 - a. Length, 7 feet.
 - b. Diameter, 10- to 12-inch top.
3. Gate posts (from best straight trees, mostly split) :
 - a. Length, 9 feet.
 - b. Minimum face, 10 to 12 inches.

Prices received for the sale of posts in Mr. Elliott's post yard at the farm have varied over the years, but the following is about the average received :

1. Line posts :
 - a. Round, 20 cents.
 - b. Split, 25 cents.

Growth of black locust as measured August 1941
[M. T. Elliott farm, New Harmony, Ind.]

Date planted	Origin	Average diameter breast high	Average height	Trees per acre ¹	Date clear cut	Posts produced per acre per year	Natural reproduction
		<i>Inches</i>	<i>Feet</i>				
1895.....	Root cuttings.....				1918	² 100	
1898.....	do.....				1920	135	
1904-6.....	Seedlings.....	10.6	75	76		40	Tulip, elm, ash, sugar maple, soft maple, sassafras, hackberry, hickory, sycamore, shrubs.
1916.....	do.....	10.6	65	120		61	Ash, tulip, red oak, white oak, sassafras, hickory, black walnut.
1920.....	do.....	7.5	60	285		90	Ash, tulip, sugar maple, hackberry, red bud, basswood, cherry, blackberry, box elder.
1930.....	do.....	4.5	43	384		97	White oak, basswood, black cherry, box elder, chestnut-oak, ash, hickory, elm, hackberry, shrubs.
1918.....	Stump sprouts.....	6.5	50	292		51	Ash, elm, blackberry, buck brush, elder.
1920.....	do.....	6.1	50	560		123	Ash, black walnut, sassafras, oak.

¹ Number of black locust trees found on ground August 1941.

² Line posts only considered.

NOTE.—Since this article was written, 1,500 line posts per acre have been cut from the 1904-6 planting, leaving all trees under 8 inches.

2. Corner posts, about 50 cents.

3. Gate posts, about \$1.

In reviewing these prices it must be kept in mind that Mr. Elliott's farm is in a geographical region where native black locust is quite common for some distance north into Indiana and south into Kentucky. This and the fact that these prices are "on the farm" undoubtedly account for the rather low prices received.

From a purely economic standpoint Mr. Elliott's black locust plantings can be outlined as follows on the basis of average totals per acre per year over a 20-year period:

Costs:

Site preparation, stock, planting, etc.....	\$0.87
Taxes, maintenance, interest, etc.....	1.00
Cutting and handling annual post production of about 85 posts per acre at 4 cents..	3.40

Average total cost.....	5.27
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Income:

From sale of 85 posts per acre per year at an average price of 25 cents.....	21.20
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Indicated net income per acre per year from black locust plantings.....	15.93
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While it is impossible to present an accurate financial account of just what Mr. Elliott's black locust plantings have meant to him and his farm business it can be said that he has sold thousands of posts which have added hundreds of dollars to his annual cash income. In this connection he stated that the annual income from locust posts has just about covered the taxes on his entire 638-acre farm. A good example of a cutting and sale of posts is seen in the February 1920 harvest in his 1898 planting—a total of 668 posts was cut and sold from an area of one-fifth of an acre in this plantation. The following is a copy of Mr. Elliott's records covering this operation:

569 posts sold at 35 cents.....	\$199.15
5 posts sold at 30 cents.....	1.50
94 posts sold at 25 cents.....	23.50

Total received.....	224.15
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Deducting Mr. Elliott's average costs of establishing and maintaining his locust plantings, and with no deduction for labor in cutting and hauling since additional posts and wood from the tops was of sufficient value to cover these labor costs, this one-fifth of an acre netted a cash income of \$216.25 or an annual revenue of \$9.82 net.

In addition to cash income derived from the sale of posts, hundreds of posts cut from these plantations have been used in fence construction and maintenance on the Elliott farm. Considerable quantities of wood have been cut also from locust tops and utilized for fuel.

In the management of over 25 acres of his black locust plantations, Mr. Elliott has found that natural reproduction of the more common native hardwoods as indicated in

the table, will take over the areas gradually if not controlled.

In order to obtain the best sprout reproduction he recommends that trees be cut low to the ground, as this tends to ensure against breakage of sprouts during wind or sleet storms.

Mr. Elliott points out that he has derived many other benefits from his black locust plantings aside from the production of posts and wood. He values his plantings in the conservation of soil and water, in providing cover for wildlife, in serving as windbreaks and in making the farm more attractive.

BUILDING A TERRACE WITH A ONE-WAY PLOW

BY EDD ROBERTS¹



Building a channel-type terrace with a one-way disk plow at the Cherokee Experiment Station, Oklahoma

TERRACES can be constructed with one-way plows economically and satisfactorily. In the wheat country this method has one distinct advantage—it is less trouble for a wheat farmer because he has such a plow available on the farm.

On June 17, 1942, tests were made at the conservation experiment station at Cherokee in northwestern Oklahoma. Besides the writer, those participating were County Agent A. R. Jacob, Harley A. Daniel, project supervisor of the station, Engineer M. B. Cox, and H. C. Hyer, conservationist in the wind erosion area. In two different tests the channel-type terrace was built at the rate of 300 feet per hour and 350 feet per hour. This means that the average wheat farmer will build from one-half to three-fourths of a mile of terrace per day with an 8-foot one-way plow. Such a plow was used in the test at the Cherokee station and it was not mounted on rubber.

It required 12 rounds to build the channel-type terrace shown in the photograph. It took 8 rounds to construct the ridge of the terrace and 4 rounds to complete the channel. The capacity of the channel was 17.3 square feet. The height of the ridge was 1.8 feet.

¹ Extension soil conservationist, Western Gulf Region, Soil Conservation Service, Stillwater, Okla.

The terrace was constructed immediately after the wheat was harvested. The soil was in excellent condition for any type of tillage practice, as it was neither too dry nor too wet. The wheat had been combined, and a heavy covering of straw had been left on the land. The one-way plow cuts and handles the loose straw perfectly.

In Alfalfa County, where the experiment station is located in the heart of the wheat country of Oklahoma, it is estimated that 3,000 one-way plows are owned by farmers—practically every farmer has this implement and some have two of them. All farmers who use the one-ways also have the power to pull them since they have been handling their farming operations with tractors for some time.

Building the channel-type terrace with a one-way is similar to building a channel terrace with a turning plow. The ridge is built first merely by moving a 2-foot cut of dirt with each round for about 8 rounds. In constructing the channel, a land is laid off so that one border of it is the center of the ridge of the terrace, and the other border

is 9 feet above the center of the channel. By plowing around and around this land, the dirt is pushed both ways out of the channel, and the dead furrow is left in the center of the channel.

In starting the construction of the terrace it should be remembered that the survey line of the terrace should be the center of the channel, and a line 9 feet below this should serve as the center line of the ridge.

Farmers in the wheat section of western Oklahoma have begun to use the one-way in building channel-type terraces. M. A. Davis, a wheat farmer southwest of Guthrie, who has had some 10 years' experience in terrace construction, likes the channel-type terrace in the wheat country because it is easier to cross with combine implements and farm implements than the high-ridged terrace. Allan Every, of Piedmont, west of Oklahoma City in Canadian County, and Loyd Long, of Garber, east of Enid, have adapted the channel-type terrace in the small-grain country.

FARMER ORGANIZATIONS COOPERATE FOR VICTORY

BY JOE J. KING¹

Small farmers in the cut-over areas of the Pacific Northwest, if given the opportunity, can contribute "food and fibre" to the Food for Freedom program. Two soil conservation districts, cooperating with the Farm Security Administration's community and cooperative services section, are finding new ways to help provide the opportunity. It is pioneering work; but it has proceeded far enough to indicate effective methods for coordinating war efforts of county land-use planning and Federal action programs. Examples may be found in Skamania County and Snohomish County in Washington.

Seven years ago the Skamania County Land-Use Planning Committee called on the United States Bureau of Chemistry and Soils to advise on the suitability of the county's logged-off lands for general agriculture. The committee learned from the Bureau's report that 11,000 acres of logged-off land, if cleared, would be of excellent quality. They found, too, that practically all the county's farms lacked sufficient acreage to serve as economic family units. Actually, the average farm had about 15 acres of cultivated land.

On the basis of these findings the county commissioners purchased on the committee's recommendations an RD-8 bulldozer to clear logged-off lands.

Land clearing charges were \$6 per hour, which included time of operator, manager and operation, and moving the machine. In more than 4 years of intermittent operation, some 700 acres of logged-off lands were cleared and about 150 acres of fruit trees were "pulled."

Several serious difficulties appeared in the program. To begin with, the county commissioners also used the bulldozer on road maintenance and construction. Next, various misunderstandings developed from the lack of adequate farmer representation in the management of the machine. Finally, the bulldozer broke down frequently under the strain which it received from varied and heavy assignments.

Many farmers gradually began to disapprove of having the county operate the machine. Thus, when the machine wore out, plans were laid to organize a cooperative land-clearing association. Neighborhood, community, and district meetings were held. Farmers democratically discussed the practical operation of the proposed cooperative. Assistance was sought from Extension Service, Soil Conservation Service, and Farm Security Administration, and on March 31, 1942, several farmers actually organized and incorporated the Columbia Farmers Cooperative, Inc.

The county USDA War Board, on April 27, issued this statement: "The War Board feels that additional land within the area should be cleared; that this program is vitally important now, during the emergency, to stimulate necessary food production, but is also approved as a long-time program, whereby individual farm pasture and crop acreage can be systematically increased to insure economically sized farm units."

This land-clearing program promises to bring scores of *underemployed* small farmers into maxi-

¹ Chief, regional cooperative section, Farm Security Administration. The author acknowledges assistance from letters and documents written by W. S. Gillard, H. J. Card, T. A. Steele, Dale Wroe, Ray Davis, W. C. Pettibone, Gerald Oftebro, C. W. Peters, and others.

imum production of war-needed food and fibre. FSA Supervisor Wroe, in commenting on the association, remarked that "if these farmers could develop their units so they could stay on the farms and not have to work for nothing it would give them an incentive to become better farmers and also raise the standard of living for their families besides putting more good agricultural land into production . . . The additional cleared land in these two counties will add greatly to the increased production of food to meet the war needs, as this will put considerably more food crops on land which is now nonproductive."

Without a great deal of difficulty, the new cooperative located a used, but reconditioned, RD-6 bulldozer. Application was then made to Farm Security Administration for a \$4,500 cooperative association loan. The loan was approved; and the cooperative got under way with a sign-up of 5,000 hours of clearing work.

Cooperative principles were followed—one member one vote, equitable membership requirements, patronage dividends, etc. Membership fee was \$5, with a \$3 deposit for each acre to be cleared. A service charge of \$6 per hour was set for operations. All work was for cash. The amount of service to any one member in a year was limited to 150 hours.

Of most importance was the fact that the cooperative was anxious to conduct its land-clearing activities so as to bring about correct land use. To achieve this objective, a memorandum of understanding between the Columbia Farmers Cooperative and the Underwood Soil Conservation District was written. The cooperative agreed (1) to provide a tractor operator and to keep the machine in satisfactory mechanical order; (2) to furnish a manager who would efficiently route the bulldozer; (3) to provide a trailer for moving; (4) not to clear land that had a capability classification of worse than class IV (class IV is defined as "land that, from the standpoint of inherent soil characteristics and environmental features, is not suitable for regular or continuous cultivation with the production of moderate to high yields of the adapted crops, but with adequate protection is suitable for uses that may involve short periods of cultivation"); (5) to make the bulldozer available to all land operators who were members of the cooperative as long as they could pay the hourly scale; and (6) to encourage all land operators who use the tractor to have the district prepare a plan for soil conservation operations.

The district, in turn, agreed (1) to make land-capability classifications; (2) to encourage land operators to use the bulldozer; (3) to provide technical assistance and supervision in carrying out conservation practices; (4) to make district equipment and

materials available in order that correct land use operations and practices might be obtained; (5) to furnish power to move the bulldozer and trailer; and (6) to prepare conservation plans.

Today this agreement is in effect. The cooperative is functioning. Land-clearing costs to the farmer average around \$17 per acre. After a month's operation, more than 50 acres have been satisfactorily cleared. And so it is that scores of Skamania County "small farmers," underemployed and in most instances reluctant to desert the land for the lure of urban employment, are progressively increasing their production of critical foods for the United States Department of Agriculture food for freedom program.

While the Skamania County group is mainly concerned with increasing the amount of good land from which more critical foods may come, the Snohomish County group is helping to maintain an adequate supply of war-scarcity "fibre." Several years ago, when the Snohomish County Land-Use Planning Committee dug into the problem of its small cut-over land farmers, it discovered that land clearing alone was not enough to meet the problems. The county had between 75,000 and 80,000 acres of farm woodland, mostly in second growth. Much of this acreage was suitable only for forest. The individual farmer, who seldom had more than 75 or 100 acres of timber, found it uneconomical to get out his few cords of pulpwood or poles and market them alone.

Not until 1938, when the Soil Conservation Service opened its CCC camp in the county, did tangible action start on solving the problems. The Service, after checking on erosion conditions, discovered that the woodland areas played an important role in determining the amount of land erosion and in determining the economic condition of the small farmer. Thereupon the representatives of the agency, along with the county agent, initiated an active educational campaign. They pointed out to farmers the value of their forest lands, both in relation to conservation of water and soil and to income from woodland.

Meetings were held. Farmers discussed their woodland problems. As a result of their discussion, they decided to organize a cooperative association to achieve two main objectives. First, they would help farmers with small cultivated acreages and limited wood lots to market their forest products efficiently and profitably. Second, they would teach sustained-yield principles so that the farmers might "farm" their woodland.

The Washington Forest Products Cooperative Association, the first of its kind west of the Mississippi, was incorporated in May 1940, with 45 charter members. Membership was open to farmers "owning

5 acres or more of woodland; or renting 10 acres or more." Membership fee was \$2.50. A seven-man board of directors directed the association, with six elected by the membership and the seventh appointed by the Washington State Director of Agriculture. The association employed a farmer-manager. All normal cooperative principles were to be followed, including one member one vote, patronage dividends, and others.

The association signed a blanket marketing agreement with each member to handle his forest products, "from tie timber to Christmas trees to cascara bark." It possessed the authority to pool members' products, to determine scales and standards, to select selling agencies in or out of State, and to sell either wholesale or retail. From May 1940 to December 31, 1941, the association had a total income of \$35,497.87. Its total deductions were \$34,984.72, leaving a net income of \$513.15. By May 1942, its membership consisted of 62 farmers.

The organization, concentrating on poles and piling, experienced no difficulty in marketing its products; but as its membership increased, the association discovered an increasing need for operating capital. Many members, having no other income for family living except the sale of fuel timber, required cash advances to carry them through the cutting season.

Unable to obtain the credit from any other source, the association applied to Farm Security Administration for a direct cooperative association loan of \$1,800. This amount would permit a \$3 cash advance on each of 600 cords. The loan was approved; and the money was soon put to work, helping to provide wood fuel for the Puget Sound area.

As one part of FSA loan approval, it was stipulated that the association would "enter into a working agreement with the Soil Conservation Service, United States Department of Agriculture, providing for the continued supervision and assistance of the Soil Conservation Service in carrying out the cordwood marketing activities of the borrower." A memorandum of understanding, consequently, was signed on August 14, 1942, between the Snohomish Soil Conservation District and the Washington Forest Products Cooperative Association. The district agreed (1) to provide technical assistance; (2) to furnish limited office space and clerical help; (3) to guide the cutting in sustained-yield principles; (4) to advise on market conditions; and (5) to make field conservation plans. The association, in turn, agreed: (1) to develop sound forest management and sustained yield; (2) to practice conservation methods; and (3) to seek technical advice from the Snohomish Soil Conservation District.

Not only is this cooperative organization of small farmers contributing wood fuel at a time when city wood fuel supplies are low, but it is also providing a source of supplementary income to people who, for one reason or another, are reluctant to enter full industrial employment. The Washington Forest Products Cooperative Association is serving a real wartime function.

Other activities of a similar nature are beginning in several rural areas of the Pacific Northwest. All have the major objectives of helping underemployed small farmers bring their labor and land into full production of war needed food and fibre. Equally important to a fighting democracy, these activities show a promising way for effectively coordinating agricultural planning and action programs.

THE USE OF KUDZU IN A ROTATION SYSTEM

By E. C. RICHARDSON¹

A large acreage of cropland in Alabama has been so severely damaged by erosion that it is no longer suitable for cultivation, and has been abandoned. A still larger acreage has lost so much soil that it is being cultivated at a loss, and is approaching a condition that may result in abandonment. These losses in soil resources have resulted from con-

tinuous clean cultivation of sloping land without sufficient protective vegetation in the cropping system to prevent erosion.

Much of this eroded land will be needed for cultivation in the future; but it must be reconditioned before it will produce satisfactory yields of most crops. Probably the best way to restore the productivity of these eroded soils is to cover them for a period of several years with a dense growth of deep-rooted vegetation that will control erosion, increase absorptive capacity, and add nitrogen and organic matter. Per-

ennial legumes that will grow vigorously on poor land, and also will produce forage for livestock, are ideally suited for the job of rebuilding these run-down soils.

Until recently, very little attention was given in the Southern States to the possibility of using perennial legumes in crop rotations. In many instances, cultivation was continued until the land was eroded to such an extent that it no longer was fit for crop production; then it was abandoned to broomsedge, poverty grass, common lespedeza, and pine trees that might come in through

¹ Project supervisor (Research Project No. 2), Soil Conservation Service, Auburn, Ala. The article is adapted from a paper presented at the meeting of the Association of Southern Agricultural Workers, Memphis, Tenn., February 6, 1942.

natural reseeding. After a few years under this type of cover, the trees were cut and the land was brought back into cultivation for a few years—until further erosion again caused it to be abandoned. Each period of cultivation was shorter and each period of rest was longer than the preceding one. Such a system merely delayed the final destruction of the land's usefulness.

It is obvious that even if this rotation of row crops and pine trees had effectively controlled erosion it would not have been good land management in a section where the acreage of cropland per capita of farm population already was too low. It is essential that these eroded soils be treated in such a way that they will give a continuous return in forage or other crops while they are being protected from the destructive forces of erosion.

In 1916 the Alabama Agricultural Experiment Station planted an area to kudzu. It was allowed to grow until 1919 when the land was plowed and devoted to the production of corn, oats, and sorghum. Records were obtained for 11 years of the yields on this area, and on an adjoining plot where kudzu was not planted. For 4 years annual corn yields were increased approximately 20 bushels per acre. For 7 years annual oat yields were increased about 7 bushels per acre. Sorghum hay yields were increased 1.25 tons per acre per year for 2 years. Results of this work were reported in the Alabama Experiment Station Bulletin 232.

On the basis of this and other work at the Alabama station, kudzu was given an important place in the erosion-control program of the State from the beginning of the Soil Conservation Service program. Approximately 2,000 acres were planted to kudzu in the Dadeville Project area in 1935, the first planting season. Most of it was planted on land that had been abandoned to broomsedge, shrubs, and trees. In practically all instances the best land was retained for row-crop production. Fertilizer and clean cultivation were recommended the first year, but farmers did not appreciate the value of kudzu, and few of them complied with these recommendations. By 1938 a number of the kudzu plantings had developed sufficiently to supply some grazing. A few areas were cut for hay.

In 1939, two terrace interval strips of well-established kudzu were plowed and planted to corn. This was done to determine and demonstrate the value of kudzu as a soil-building plant and also to determine whether or not it could be han-



Above.—Kudzu planted on Cecil soil in 1935 had developed sufficiently to harvest hay in 1938 and 1939; in 1940 it was plowed and followed by corn—note kudzu in corn after last cultivation.

Below.—Same field as above, at maturing of corn; latter yielded approximately 38 bushels per acre.



dled with the ordinary farm equipment that was available.

The kudzu vines were cut with a disk to prevent balling of the residue in the plowing operation. In March, after disking, the land was flat-broken, allowed to settle, and then bedded. In late April, phosphate was applied in the drill and the corn was planted in the water furrow.

The Kudzu growth was controlled by plowing until the corn was approximately 30 inches high. It was allowed to grow back and produce a cover for winter protection of the soil and to reestablish it for future hay production. Two complete cultivations of the corn were sufficient to control the kudzu growth, but not enough to eradicate it.

The yield of corn in these two strips was approximately 30 bushels per acre, an increase of about 20 bushels. When the corn was harvested, cattle were turned into the field and some excellent

grazing was obtained. The residue of vines left on the land after grazing was sufficient to give considerable protection during the winter.

In 1940, further studies of the possibilities of kudzu as a soil-conserving crop in rotations were made cooperatively by the Soil Conservation Service and the Alabama Agricultural Experiment Station. For these studies 20 different areas of kudzu, from which hay had been harvested the previous year, were selected. These areas were located in the Piedmont, in Limestone Valleys, and in Appalachian Mountain and Coastal Plain regions.

As a typical example of soil conditions on land where these studies were made, an area of Red Bay soil, a medium-textured coastal plain soil, was said by the owner to have made from 5 to 7 bushels of corn an acre the year before it was planted to kudzu. Kudzu was planted in 1936 and was harvested

for hay in 1938 and 1939. The acre yield of corn in 1940 was 30 bushels, approximately a fourfold increase over the yield on this land before it was planted to kudzu. The stand of kudzu was completely restored by the end of 1941 growing season, and this area could again be plowed for corn in 1942.

The actual production cost, including phosphate and man and mule labor at current prices, was \$5.80 per acre or \$0.19 per bushel. The production cost on heavy clay soils was higher because of greater difficulties in soil preparation.

Results of these trials show that corn can be grown successfully in rotations with kudzu. Yields were increased approximately fourfold, and in many instances kudzu made enough growth by the end of the summer to protect the soil against erosion.

These results also indicate that the length of the rotation that will be feasible will depend upon soil conditions. On those severely eroded experimental areas where soil conditions were extremely unfavorable, recovery of the stand indicated that it probably will be necessary to allow kudzu at least 2 years in which to reestablish a dense ground cover. Recovery of the kudzu on the better areas was so rapid that it appears safe to assume that a good stand can be maintained where corn is grown every other year, provided no hay is harvested. It appears also that on these better areas corn can be grown the first year, kudzu hay can be harvested in the late fall of the second year and in the summer of the third year, and another crop of corn can be grown the fourth year.

There is a vast acreage of steep land in Alabama and other southern States on which less than 10 bushels of corn per acre is being produced. Under continuous cultivation this land is suffering more and more from erosion, so that yields are steadily decreasing. Rotations of kudzu and corn would bring larger acre yields of corn and also would control erosion.

Entire fields of this steep land are such that it will be most feasible to carry on rotations between kudzu and corn in alternate strips. In other places, rotations may be between kudzu and corn in two or more strips on the critical slopes through fields, while other parts of the fields may be devoted to rotations of cotton, small grain, and annual soil-conserving crops that can be seeded on the grain. By growing the major portion of the upland corn in rotations with kudzu on the steep cropland, it will be

possible to develop simpler and more effective rotations on the better land. If most of the hay is harvested from kudzu in the rotations on the steeper cropland, more of the vegetation grown after small grain can be left on the land, to reduce erosion and increase soil fertility.

Although first consideration probably should be given to developing rotations with kudzu on the steeper cropland, this crop also may be used to advantage on other land. In many instances moderately sloping areas have been so eroded and depleted of organic matter that normal soil-conserving rotations are not fully effective. The residual effects following kudzu at the Alabama Experiment Station suggest the possibility of using this crop to build up the fertility and the organic content of depleted soils. After remaining under a dense cover of kudzu for a few years the land could be plowed for other crops. Normal rotations of cotton, small grain, and soil-conserving crops seeded on the grain should be more effective on land that has been built up by kudzu. The crowns that can be gathered when a stand of kudzu is plowed for cultivated crops can be used to plant the next area to be treated on the farm. Rotations with kudzu can be much longer on the better cropland than they can be on the steeper land discussed in the foregoing paragraphs. Although rotations of this kind have not been developed and tested in the field, it would seem that such rotations should receive careful consideration in future field research.

Like other crops, kudzu has its limitations. It does not grow satisfactory on the calcareous soils of the Black Belt, on very plastic subsoils, or on poorly drained soils. It must be fertilized with phosphate, particularly on severely eroded areas. Observations made in the field indicate that potash also will be necessary on soils deficient in this nutrient. Under average conditions, kudzu is not sufficiently established to be used for hay or grazing before the third growing season after planting. During the first two years, however, it should be interplanted with clean-tilled crops from which a return may be obtained. Mowing and grazing must be regulated properly to avoid serious injury to the stand.

Kudzu is not recommended as a crop to cure all the ills of southern Agriculture. However, its performance in the field has been such that it has earned a place on the farms of the cotton South where the problems of soil erosion, dis-

astrously low corn yields, and low income are so prevalent.

Conclusions with regard to the use of kudzu in rotation systems are as follows:

1. Corn can be grown successfully in rotation with kudzu.

2. Increased crop yields as a result of turning kudzu have been noted for a period of 11 years; however, to control erosion effectively on sloping lands and maintain a stand of kudzu, the rotation should be much shorter.

3. On steep, severely eroded areas where soil conditions were unfavorable, 2 years were required for the kudzu to recover fully.

4. On areas where soil conditions were more favorable, recovery of kudzu was so rapid that it is safe to assume that a good stand of kudzu can be maintained where corn is grown every other year provided no hay is harvested. When it is necessary to harvest hay in the rotation, an extra year will be necessary for the kudzu to recover.

5. On depleted soils where erosion is not a problem, kudzu may be used to improve the soil.

War Pastures

On suitable soils, under humid conditions, the fertility of pastures can be maintained profitably at a level that will produce enough forage to carry at least one cow per acre, which is the equivalent of four or five ewes and their lambs per acre, throughout the grazing season. Another acre of similar productivity is required to raise the feed for a cow or a fattening steer during the winter or barn-feeding period.

Farmers have the choice of two procedures: They may carry their stock on pastures that supply merely a maintenance ration, and depend entirely upon harvested feed for the production of meat and milk; or they may make their pastures highly productive and obtain weight gains and increased milk yields from grazing. In view of the necessity for protecting and improving our soil and the scarcity and high cost of farm labor, it behooves farmers to increase the production of vital foods, such as meat and milk, by making their pastures yield more. This will enable them to avoid the serious mistake of the last war—breaking grassland that should not be plowed. More dependence on pastures will help farmers to produce livestock products at less cost, and will help all of us to avoid the disastrously inflated prices of the first World War.—*A. T. Semple.*

GREAT DIVIDE DISTRICT PIONEERS IN RANGE CONTROL PROGRAM

BY LLOYD A. ACOTT¹

For nearly 45 years, competition for the spring-fall range in the Great Divide area of northwestern Colorado has been very keen. This region, between Fortification Creek and Little Snake River, some 12 to 20 miles north of Craig, has long been of strategic importance in livestock operations because of its location between high summer range and winter desert range.

Cattlemen, sheepmen, and dry land farmers have competed for control of the region. Cattlemen first came with their steer outfits in the 1880's. Cattle reigned supreme for a score of years, but the severe stocking of sheep ranges in southwestern Wyoming pushed two herds of sheep down into the Great Divide area as early as 1895.

These two herds paid only a short visit, however, for cattlemen threatened to prove at pistol point that possession was at least nine points of the law. Again, in 1901, a herdsman brought in his sheep, only to flee before the "persuasiveness" of the cattlemen. But, of course, this kind of range warfare couldn't go on forever. On January 24, 1908, sheepmen and cattlemen signed a range compromise at Baggs, Wyoming, whereby certain parts of national forest and public domain were recognized for sheep use.

As early as 1905, sheep were gradually replacing cattle in the Great Divide. Then, beginning in 1915 another kind of frontiersman came—the dry land farmer. Colorado newspapers had published glowing stories about the fertile soil and its abundant crops. The magic words had spread—"There's free land in Colorado!" Hundreds of people thronged through Craig and moved northward to stake homestead claims. Smoke clouds from burning sagebrush often darkened the horizon as land was eagerly cleared. The thriving little town of Great Divide sprang up, and soon 75 percent of the public domain had been filed upon.

For a while, during a period of "wet" years, farmers raised good crops in the new soil and prospered. Then food prices slumped; rain and melting snow had removed topsoil from the steep hillsides. This together with the return of "dry" years, which



This community drift fence between sheep and cattle ranges in the Great Divide Soil Erosion District was constructed of aspen posts which had been treated with zinc chloride.

really were "normal" years, caused a general abandonment of the dry land farms.

Of the original 1,500 families who had settled in the Great Divide area between 1915 and 1930, only 47 families remained in 1937. The others had been driven out by drought, loss of topsoil, and poor markets. Sheep raising had finally become the dominant industry of northwestern Colorado, and most of the remaining homesteaders had quit wheat farming and shifted to cattle or sheep.

Thus, when Colorado's first soil conservation district was organized by the residents in the Great Divide area in December 1937, conditions were far from ideal. Approximately 150,000 of the total of 275,000 acres now included in the District were abandoned land—

"wild land"—not controlled by anyone, owned by nonresidents, often badly eroded and usually grazed by everyone's stock. Much land had become tax delinquent, and the Moffat County tax assessor actually had no record of the addresses of people who had once owned some 20,000 acres. In a few instances, tax delinquency had continued for 18 years, largely as a result of the expense of obtaining tax title, and the low value of the land involved.

It was to meet these and other problems that landowners of the Great Divide formed the soil conservation district. In 4 years, they have established a more stable use of the range and have made a promising beginning in range restoration. Today, cattlemen, sheepmen, and farmers are working together to solve their common problems.

¹ District conservationist, Southwest Region, Soil Conservation Service, Albuquerque, N. Mex.

Through cooperation in controlled use, they are gradually restoring the land to its former value as livestock range. Newly seeded crested wheatgrass and western wheatgrass are replacing weeds on 3,500 acres of abandoned crop land.

Since these district supervisors and cooperators have pioneered in solving vexing range problems, Dr. H. H. Bennett, Chief of the Soil Conservation Service, asked for a special report on the Great Divide when he visited Colorado recently. Louis Visintainer, vice-president of the District Board of Supervisors, wrote Dr. Bennett, telling how the district has largely overcome the land abuses and confusion of the past half-century.

When the district was first organized, Visintainer explained, approximately 150,000 acres of privately owned land were not leased by anyone and were severely overgrazed. To make matters worse, these 150,000 acres were scattered throughout the district, intermingled with lands being operated by owners.

The district first tried to secure leases from absentee owners, but was unsuccessful except in a few instances. Since the former homestead tracts were in poor condition, lacked water, and customarily had been grazed free, the income from grazing was only about 1.6 cents per acre whereas the yearly tax assessment was 4.87 cents per acre!

The district urged Moffat County to acquire the tax-delinquent lands, but the commissioners explained that the existing State law made this an expensive procedure. At this point, the district supervisors requested the Federal Government to purchase some of the uncontrolled lands through the land utilization program. The supervisors believed that the Government could develop watering places, construct fences, and improve the purchased lands so that the entire range could be put on a paying basis.

The Federal Government agreed, and 37,000 acres have been bought. Land was purchased only from owners who wanted to sell, and was then leased by the Government to the conservation dis-

trict which is now issuing grazing permits on these lands to local ranchers. The Government receives rental income from the land, with Moffat County getting one-fourth of the revenue to compensate for taxes formerly assessed against the land.

In the meantime, the district supervisors had continued to discuss the tax-delinquency problem with the county. Finally the chairman of the County Commissioners arranged to have State legislation introduced to make it less expensive for counties to acquire tax-delinquent lands. This bill became a law, and Moffat County acquired the tax-delinquent lands within its boundaries.

During 1940 and 1941, the district leased 14,000 acres of tax deed land from the county. Grazing permits are issued to about 50 local livestock operators, who use range lands leased by the district to graze their cattle and sheep, thus supplementing their privately controlled range. Under the county lease, the district has agreed to undertake range improvements costing 2 cents per acre per year and to pay Moffat County an annual rental of 90 percent of the return from county land. Improvement on county leased lands, made possible with AAA funds, have consisted during the past 2 years of the development of three stock water reservoirs and two stock water springs.

In addition to acreage leased by the district itself, individual ranches have leased an estimated 50,000 acres of unprotected land to be used in connection with district-leased lands.

The results to date are that the 150,000 acres of "wild" land have dwindled to a point between 15,000 and 20,000 acres. Trespass drift by livestock has been almost entirely eliminated. The grazing permits issued by the district provide for proper range use of lands covered by the permit and also of privately controlled lands, so that the range may be given a chance to recover. Stock water has been developed not only on the Federal lands but also on other lands controlled by the district and by individual operators.

By using Pittman-Robinson wildlife funds, the district has constructed about 5½ miles of fence around small areas of eroding gullies to protect sage grouse and reduce erosion. Flocks of sage hen, the vanishing game bird of the West, find protection here and the eroding gullies have an opportunity to become revegetated. The district has assisted landowners in constructing 37 miles of drift fence for the purpose of controlling livestock while on the range.

In connection with water development, Visintainer stated, it became evident more than a year ago that the existing State law concerning the construction of dams was inadequate. It did not provide an inexpensive method of getting water rights for small livestock water dams and was unduly restrictive regarding height of dams.

For these reasons, the district assisted last winter in having a bill presented to the State legislature to make it possible for ranchers to secure a legal right to water stored in small dams for a small fee and with a minimum of red tape. The bill also provided that livestock dams might be built to a height of 15 feet without violating the irrigation-water type reservoir law, thus often reducing the expense of cutting spillways and giving greater water storage, especially in depth.

The legislation was passed, and water development has been facilitated in the Great Divide District. Fifty-eight stock-watering reservoirs, springs, and wells have been developed in the district since its organization.

The president of the District Board of Supervisors is Roy Simon, long-time resident of Moffat County and an active farmer and stockman. Visintainer, the vice president, is a former president of the Colorado Wool Growers Association and former director of the National Livestock Association. Frank C. Estey is secretary-treasurer, and the two remaining members are Henry Prather and J. F. Jacobsen, both of whom homesteaded land in the district about 23 years ago.

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Compiled by **ETTA G. ROGERS**, Publications Unit



Field offices should submit requests on Form SCS-37, in accordance with the instructions on the reverse side of the form. Others should address the office of issue.

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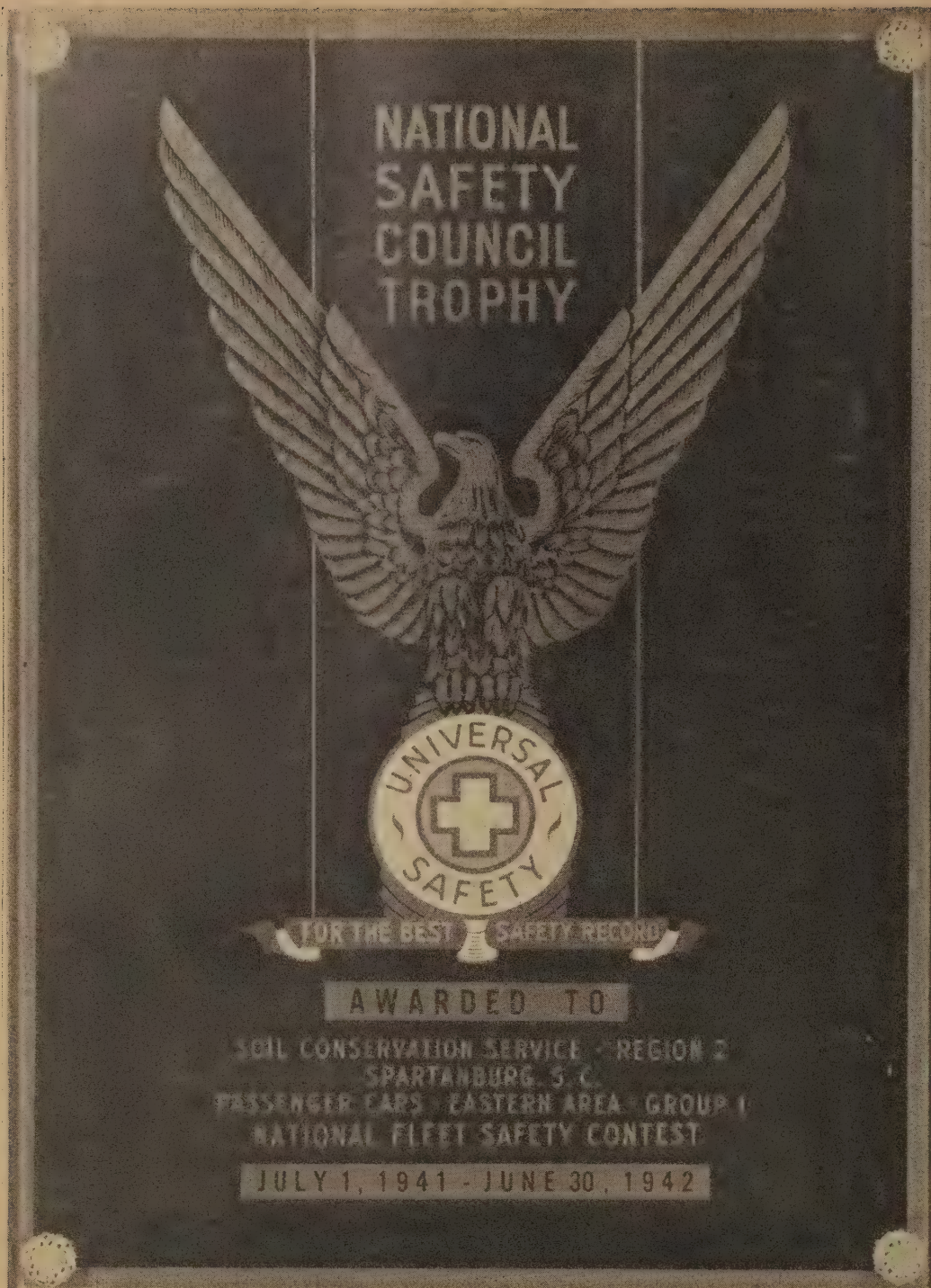
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SCS Wins National Safety Award

The Southeastern Region of the Soil Conservation Service, headquarters at Spartanburg, has been awarded first place in the National Safety Council's contest for large passenger-car fleets in the eastern United States for the year ended June 30, 1942.

Forty-eight major passenger-car fleets, operated by private concerns as well as State and Federal agencies, took part in the contest.

The Soil Conservation Service operated its cars with an accident frequency of only 0.22 per 100,000 miles of travel. This is equivalent to 450,000 miles of travel per accident or more than a lifetime of driving without accident for the average American motorist.

The Service has a maintenance problem in that its cars and trucks are scattered throughout the region and cannot be serviced and repaired in a centralized shop, such as is maintained by most commercial concerns. This problem was met by negotiating service, inspection and repair contracts with commercial garages and by placing the responsibility for proper maintenance and safe operation on the individual drivers.

Since June 30, as a part of the rubber conservation program, passenger car travel by Service employees has been virtually eliminated. However, the Service is intensifying its safety program in connection with the maintenance and operation of other vehicles.

Richard B. Gossom, Jr., is the SCS regional safety engineer.

SOIL CONSERVATION



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WELLINGTON BRINK
EDITOR

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SOIL CONSERVATION

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CHIEF, SOIL CONSERVATION SERVICE

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Their future depends on maximum production today, with the land safeguarded for continuing production.

MORE FOOD WITH SOIL CONSERVATION

BY H. H. BENNETT, CHIEF, SOIL CONSERVATION SERVICE

RIGHT on the heels of the all-time production record of 1942, the farm lands of America are called on to produce still more food and other war crops in 1943.

As the war goes on our productive lands will be required to produce more and more food, fiber, and vegetable oils for military and civilian purposes. Because it is one of the first weapons of war—and the first essential of all human activities in peace or war—food must be produced in increasing abundance, year after year, so long as the struggle continues. And after the war when the supplications of hungry people throughout the world fall upon the ears of those peoples who can still produce, requirements for food may surpass all present calculations.

Few people bother about the meaning of these mounting demands on our basic resource: "That's the farmers' problem," they will say.

Actually, it is a problem affecting all of us. There is not much more good soil to plow up; we've put most of it into use. This means near-scarcity

right at the base level—at a time when the soil must keep on producing at top capacity, regardless of deficiencies of fertilizers and farm machinery and shortages of manpower and transportation.

If you keep on taking food out of the larder without putting any back, eventually there will be shortages and difficulties in the dining room. It is the same with productive soil. In the circumstances there is one inevitable question: How can our lands continue producing what is required of them?

Do enough of us know the answer?

In some degree, perhaps. Good weather, long hours of hard work by farmers, and efficient distribution of farm products make up part—but only part—of the answer as to how our limited supply of land can keep on meeting the increasing demands for high production of a long list of the utter essentials of war and peace.

In the last analysis, the only way the difficult task can possibly be solved is through soil conservation. So that this may be clearly understood, let us define soil conservation in its modern concept.

Soil conservation means the kind of use and treatment of land which matches the capabilities and meets the needs of the land, so that the soil may be safeguarded and kept productive under continuing intensive cultivation—intensive cultivation for the period of the war. This means not only that the soil and its content of plant nutrients and beneficial micro-organisms must be conserved, but that rainfall must be stored for plant growth in dry seasons and the favorable tilth of the soil maintained with appropriate measures.

Moreover, soil conservation means saving soil, not just to keep the landscape in order, but to keep the land in sound health for continuing productive use.

To accomplish these imperative ends, land must be treated with adequate measures to maintain its full productivity. According to the land's adaptability and needs, soil-building crops must be substituted and rotated at the right time and place to make up for any deficiencies resulting from the growing of soil-depleting crops; the land must be contoured, strip-cropped, and terraced as conditions demand.

Land that is too steep to be plowed must be planted in grass, perennial legumes, shrubs, trees, or whatever plants our experience may show us it is best fitted to grow. If good soil is too thickly strewn with rocks for plowing, the rocks must be removed. If fertile land is unproductive because of

too much water, artificial drainage must be provided. If, by drainage, good flat land can be substituted for adjacent erodible hill land, or for other unsuitable land by irrigation, then good soil conservation practice requires the use of these methods of reclamation.

If sufficient nitrogenous fertilizer is not available, the nitrogen-supplying legumes must be grown; and animal manures, and leaves and straw must be saved for replenishing the supply of organic matter in the soil or for mulching the land.

Other things—other practical measures and treatments—will be called for to meet the requirements of the soil for permanency. Across the Nation's multiplicity of topographic conditions and climatic pockets and zones, these measures and practices will need to be varied in a hundred ways to fit the varied local situations.

SOIL CONSERVATION INCREASES YIELDS

Many of the same measures that maintain the soil also increase per-acre yields. Fortunately, some of the increase usually comes the first year.

Every now and then some appraiser of the value of soil conservation tells us that "soil conservation is all right provided farmers can stand the financial strain long enough for the benefits to show up in increased yields." The implication that the crop-increasing effects take a long time to show up is incorrect. In most instances increased yields come almost immediately. Conservation farming, after all, means simply that the operator makes certain readjustments in his farming practices, or installs practical devices, so that what he does fits the kinds of land he has and helps to keep the soil in good health and to prevent it, along with the fertilizers, manures, and seed that he puts into the ground, from washing down the creeks.

Thousands of measurements of practical conservation farming results have been made. The prevailing facts are known; there are no longer any "ifs" about it. For example, look at the findings of the Department of Agricultural Economics of the University of Illinois:

In four important farming counties in Illinois, 90 of 121 farms studied produced more per acre of corn, soybeans, and oats, respectively, when the crop was grown on the contour than when it was grown in the old way, up-and-down the slope. On a 3-year average, contoured corn produced 7.7 bushels more per acre than noncontoured corn; soybeans grown on the level outproduced beans grown off the contour by 3.3 bushels per acre; and contoured oats beat the other kind by 10.2 bushels. On land



The two sacks tell the difference in yields between contoured and noncontoured corn fields of Nick Claussen, Nebraska farmer. Left, 30 bushels corn to the acre produced with contouring; right, 20 bushels without contouring.

of Class II capability—the majority of the fields compared were of this class—contour farming beat the old-style up-and-downhill farming by 9.6 bushels of corn, 5.9 bushels of soybeans, and 12.9 bushels of oats per acre.

The effect of contouring on corn production has shown an average increase of 11.3 bushels per acre, as measured in 1941 on 19 representative farms in the rolling sections of Iowa. In 1940 the corn acreage for the 5 principal corn States was 27,715,000 acres. If but half the increased yield resulting from contouring in Iowa in 1941 were obtained on half the corn acreage of the 5 States, the increased production would amount to 77,602,000 bushels—enough to produce 3,880,100 porkers weighing 200 pounds each.

As the result of the work carried out by the CCC drainage camps, such as cleaning silt out of drainage ditches and removing obstructing growths of brush, 13 million acres of land were brought back into production or improved in producing capacity. Some of these reclaimed and benefited lands stretch far back from the ditches along which the conservation-drainage work was done, and for this reason the results have not been adequately appraised. Anyone who misses the point of how this single item of conservation work is helping win this war, might miss also the larger point of how the great Nation-wide soil-conservation program is making a war contribution of nothing less than staggering proportions.

SOIL CONSERVATION INCREASES INCOME

By increasing acreage yields and encouraging diversification of crops, soil conservation leads farmers to eliminate some of the hazards of single-crop farming, increases income, and provides more of the necessities of a balanced, live-at-home agricultural enterprise.

Let us have a look at what conservation has done for some typical North Carolina farms in counties covering various types of farming, by examining the estimates of the farmers, themselves. These results pertain to the effects of conservation in 7 soil conservation districts, covering 28 important agricultural counties.

On 281 farms soil conservation has given the following increases in per-acre yields: Corn 43 percent, oats 32 percent, wheat 31 percent. On 249 farms in the tobacco section, the average increase was 32 percent; while on 28 farms in the peanut area the average increase was 31 percent. Cotton has shown an increased yield of 37 percent on 242 of the farms cited.



Philip Soucia, Maine farmer, can supply many an Army mess because he grows potatoes in strips laid on contour.

Pasture for grazing has been increased more than eight times on 240 farms, and production of hay has more than doubled on 243 farms. Production of home-grown seed, mainly of soil-improving legumes, has jumped up four times on 100 of the farms, and the growing of kudzu has increased by four times on 98 farms.

Numbers of cattle raised on all the farms has increased by 146 percent and hogs 68 percent. Increased poultry production has amounted to 83 percent on 237 farms.

The average annual increase in per farm income from new crops, livestock, and other outgrowths of the conservation program amounted to \$448 on 214 farms. Thus, in addition to permanent benefits to the land resulting from control of erosion and other aspects of good land use, the average annual increased income from these farms has amounted to \$95,832.

The achievement of A. L. Holeyfield, White County, Ark., is fairly representative of what has been done on thousands of farms. It is a good illustration of what can be done by a great many farmers right where they are, through sound conservation farming:

In 1935 you could drive a team up and down the

gullies on the Holeyfield farm. The soil was so badly depleted that it was practically impossible to make a satisfactory living on the place. There was a mortgage on the farm, but the land was of such little value it was not foreclosed. Twenty-five acres of cotton were producing only 4 bales. More grain was needed, more corn, more pasture, more income. Cash income amounted to approximately \$200 a year.

Mr. Holeyfield finally took to conservation farming, and now has plenty of grain and good pasture for his livestock. Gullies have been filled in and substantial terraces run across them. In 1941, 16 acres of cotton produced 10 bales; and cash income was \$1,250. Not only has this conservation farmer worked out his own problems, but he has been persistent in his efforts to encourage his neighbors to carry out similar practices. Today, there are only two farms in his community that have not instituted soil-conservation programs on their land.

In the early 1930's, P. A. Dooley of Cave Spring, Ga., was growing nothing much but cotton and corn on his 700-acre farm. Cotton was virtually the only source of cash income; it was planted on the best parts of the farm year after year. Erosion was a serious problem, but there were no terraces, no protective cover crops, no soil-improving rotations, and crop rows were not on the contour. Cotton yields averaged less than half a bale per acre.

Mr. Dooley knew something was wrong but couldn't "put his finger on the trouble." He joined up with the local erosion-control program in 1936. Benefits began to accrue at once. In 1942 his cash returns from increased yields and crops not previously grown amounted to \$5,487. His cotton yields jumped from 60 bales on 130 acres to 84 bales on 116 acres, and this brought in an extra \$2,200. There was \$850 more from 1,300 bushels of wheat and oats—crops not previously grown—and \$300 from kudzu hay, \$1,710 from 10,500 pounds of lespedeza seed of several varieties, \$222 from soybeans, and \$125 from hay.

This new income was in addition to the permanent

improvement of the land through soil conservation, together with an improvement of the woodlands and an increase in livestock. Mr. Dooley summarized the situation as follows: "The soil-conservation program has saved me from bankruptcy and my farm from destruction. Farming is now a pleasure; before it was just plain drudgery."

In New England, too, come quick dividends from conservation. R. N. Johnson, who farms near Walpole, N. H., several years ago decided that his potato farm was suffering from the effects of straight-row, up-and-down-the-slope cultivation. To operate on the contour, he removed a number of old stone fences. Then he swung his crop rows right across the slopes in alternating bands—ten rows of potatoes, then a protective strip of hay, then ten more rows of potatoes. Some of those hay strips stretched out 1,700 feet or more. To take care of excess water, he installed more than 30,000 feet of terraces and diversion ditches, and nearly 2,500 feet of vegetative outlets. All that cost money, about \$1,800.

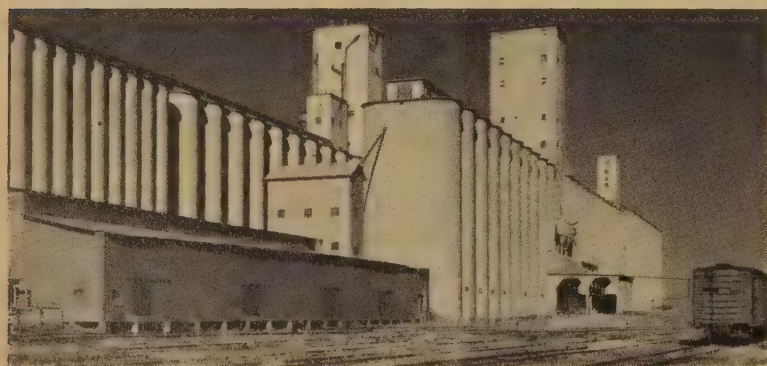
But the returns from the investment were immediate, continuing—and convincing. Recently when members of the American Society of Agronomy, holding a regional session in Durham, visited the Johnson place, they found an enterprise built for permanent high production. Mr. Johnson, like any good business man, knew exactly where he stood. He had paid the cost of capital outlay for conservation improvements out of increased yields alone. In one year, 1939, he had dug 483 bushels per acre, 76 bushels more per acre than in his best previous year. This increased yield amounting to 4,332 bushels from 57 acres in one year was enough to pay for every terrace, every outlet, every shift of fences, every single item of conservation expense.

Asked by one of the visiting agronomists, "What would it have cost you if you had not carried out this soil-conservation work?" Mr. Johnson quickly replied, "I would have lost my farm in not more than 5 years. I might have continued farming but it would have been at the direction of the bank."

NOW WE HAVE A PROGRAM

When World War I struck, comparatively few knew anything about soil erosion. There was no general concern over the problem and no national program for safeguarding productive lands from the blight of erosion, or for using them according to capability. So, 25 years ago, when farmers were asked to adjust food production to war needs, we were not prepared for any such emergency call.

We produced the food, but we mistreated the land terribly. It was a veritable Belshazzar Feast in the



Full elevators are signal flares of victory at home. Conservation helps fill these bins.



Strip cropping and diversion terraces are a trade-mark of sound production principles on these steep slopes. This is one of the numerous spots in rural West Virginia where war needs are obviously being taken seriously.

use of land. Old-field pine was cleared from thousands of hillsides in the Cotton Belt that were too steep for cultivation in the first place; countless pastures were plowed up across the Nation and millions of acres of grassland broken out for wheat and corn. It was probably the largest and most disorderly plow-up in history.

As a matter of fact, the modern method of classifying land according to its capability was not even invented at that time. This, together with such other basic deficiencies in preparedness as lack of a national program for conservation of soil and water, led us on to the orgy. Millions of acres were plowed that should never have been plowed.

The harvest from that staggering error in land use brought a multitude of evil things: Millions on millions of wasting gullies; prodigious quantities of soil flying the high pathways of the winds as dust storms; millions of acres impoverished or ruined; armies of migrating farmers, and a host of complications and difficulties erupting out of that chaos of land misuse that was so unnecessary.

In attempts to alleviate the problems that had their origin partly or entirely in that blunder, we spent in one way or another more than a billion dollars. And the scars of wounded earth have not all been healed.

Pearl Harbor found America on guard—out on the farmlands of the Nation. Much had been learned from our errors. The gods of the elements

had not for nothing blotted out sunlight over the Nation's capital with rich soil from the Plains. We *did* have a program this time for wisely using and safeguarding our capital stock of productive soil. We had well under way the largest, most meaningful and effective program of sound land use in historical time. Farmers understand this program much better than city folk, some of whom haven't realized that their welfare, also, is fundamentally dependent upon the welfare of the land.

FARMERS WORKING TOGETHER

The soil-conservation districts movement represents, I think, one of the most significant developments in land use that farm people have ever adopted. Thoroughly democratic in spirit, purpose, and procedure, the districts are now functioning to the very great advantage of our Nation at war. They have now spread to 42 States—821 of them, comprising 478 million acres—and in a number of ways they are aiding the agricultural part of the program of increased production for war.

Established and directed by the farmers themselves, the districts are making effective use of the cooperative inclinations of human beings. This working together among farmers is proving far more productive than any one had foreseen. It is helping to meet some of the difficulties created by

war demands on labor supply and on the technical personnel of the Service.

Here are some of the ways soil-conservation districts are helping win the war:

District supervisors, sensing the need for making use of every ounce of farmer energy and initiative, have swung into increased action throughout the land. An outstanding contribution by the districts arises out of the splendid accomplishments of small community groups headed by leaders selected by group members and district supervisors. These groups, usually composed of 10 or a dozen farmers, up to 30 or more, living in a compact locality or a well-defined watershed, have pushed ahead with their cooperative conservation work and other farm activities in a way that seems to deny the existence of insurmountable obstacles. They are helping one another to the utmost in getting the conservation job, and all farm jobs, done on time. They come together in schoolhouses, barns, farm kitchens, anywhere to discuss their problems, both individual and common.

Together, they make provisional conservation farm plans for their own farms and help their neighbors work out appropriate arrangements for their farms; and often do excellent jobs. In this way various phases of conservation work are getting under way without loss of time, while awaiting the assistance of an engineer or crop specialist.

Working together, community farmers give one another such moral support as is sometimes needed to encourage the adoption of new ideas, whether it be contour farming or converting a steep cornfield into pasture. In this way farmers work out really amazing plans for pooling their resources of equipment, power, and labor. Sometimes half a dozen operators, or more, will be working on another man's farm at the same time, in order to do on all the farms the things that could not be so efficiently done if they worked alone on only their own land.

Thus, through the combined increased efforts of hundreds of thousands of farmers and ranchers, a mighty blow has been struck at Hitler, Hirohito, and their fellow conspirators against civilization.

In many other ways the districts are helping. And various agencies are assisting the districts as well as one another. These aids, together with every possible aid in every specialized field of agriculture, are keeping conservation going ahead. And that is essential.

BROTHERHOOD OF THE SOIL

It should never be overlooked that work on land to keep it productive makes it possible for human beings to enjoy, lastingly, the fruits and benefits of this

basic resource, and brings people together perhaps more than any other cooperative endeavor. This is my observation from working across the years with various groups here in the United States, in Mexico, South America, and other places. I am convinced that in the struggle for adequate food—the thing for which man will fight, and die for in a pinch, quicker than anything else—there is opportunity for men working together throughout the world to come to better understandings. If land everywhere can be made to produce more with conservation treatment—and there is every reason to believe that generally it can be—one of the principal causes for discontent will have been removed or improved.

By such action, carried to the ends of the world eventually, one of the basic causes of international strife might be eliminated—through more productive land for food and raiment. Certain it is, other approaches to the proposal of ending wars have led us, 1,943 years after the birth of Christ, into the most nearly global of all the long bloody lists of wars, and the one that potentially could come nearest to blasting civilization off the earth.

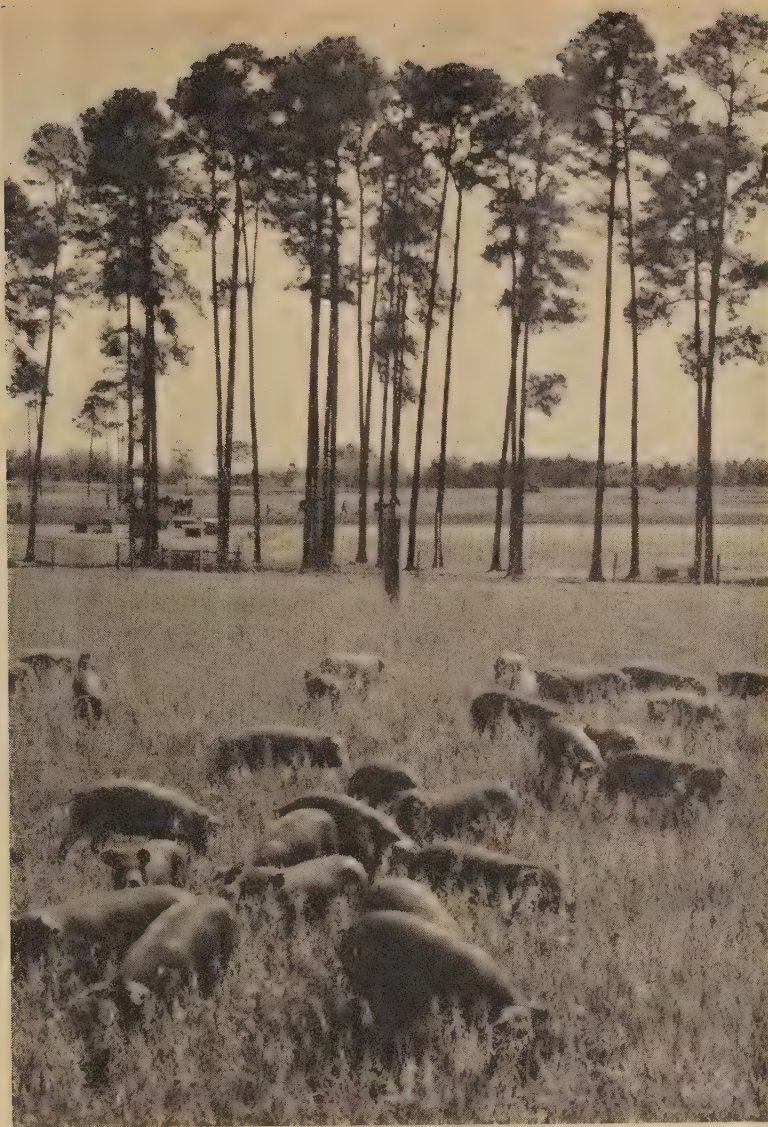
Well-fed people, living contentedly on well-tended land, are not so likely to be swept off their feet with a lot of hokum about superior races and natural spheres of influence; nor will they be led so easily into wars of aggression.

It must be remembered always that no matter how strongly constructed are our farm buildings, or how well farms may be equipped with the advantages of electricity and machinery, if the soil is permitted to wash away, all of us will have lost our sustaining capital—the source of food and life. We can replace buildings and machinery and electric lines, but we cannot replace productive land.

Moreover, the fact must not be overlooked that the world's supply of good farm land is shrinking, not increasing. It is imperative that the march of soil-impoverishing erosion be halted. The problem is at once individual and national in most agricultural countries; it becomes international in the aspects of good neighbor relations and the brotherhood of the soil.

I believe it to be the privilege and duty of the people of the United States to help the people to the South of us and the people to the West of us across the Pacific to improve their soil; therefore to increase their food supply and the quality of human living. During the war, this kind of help will be needed to increase food production and thereby add to the endurance of our fighting forces. When the war comes to an end I believe this help on the part of the United States can be furnished at a very small cost, as compared to the returns in human happiness to all concerned.

—HENRY A. WALLACE,
Vice President of the United States.



Porkers harvest oats, effect savings in labor and machinery costs.

CONSERVATION AT WORK

BY R. E. UHLAND¹

IT IS ASSUMED that for the duration of the war the United States will supply substantial quantities of food to Britain, Russia, China, and other nations that break away from Nazi and Japanese domination. Our own military and naval forces will need increasing quantities of food now that the war has spread around the globe. It seems probable that the post-war rehabilitation period will require even greater food stocks of milk, meats, oil crops, eggs, vegetables high in food value, and other essential products for a number of years. This urgent need for more feed and food products to help meet war needs demands that our past methods of handling agricultural land be improved.

The fertility of all cropland, both level and sloping, must be maintained if production goals are to

be met. It is only in comparatively recent years that soil conservation has been appreciated as a means not only of preserving cropland and grazing land but also of obtaining better production from these lands. Research findings now show that many soil conservation practices, including proper land use, can help increase the production of those crops required to meet war demands. There is no doubt now that conservation practices will result in immediate and continuing increases in crop yields.

On a cooperative farm near Bethany, Mo., badly eroded land that was limed, fertilized, and seeded to a clover-and-grass mixture produced abundant hay. This same land planted to corn after 3 years of meadow produced more grain per acre than adjacent fertilized land in third-year corn, although the latter was less steep and erosion was not as serious.

¹ Principal soil conservationist, Office of Research, Soil, Conservation Service, Washington, D. C.

Yield data on corn and soybeans, taken over a period of years in several of the principal Corn Belt States, show that, other factors being comparable, the per-acre yields of these crops were proportional to the depth of topsoil that remained. The loss of an inch of topsoil caused a lowering of the yield of corn from 3 to 8 bushels per acre. Measurements of soil losses at Bethany, Mo., revealed that during the period 1931-40 a plot 146 feet long with a slope of 7 percent lost 4.4 inches of soil by erosion. The lowered corn production associated with this loss of topsoil for 1942 was about 25 bushels per acre, or an amount sufficient to have produced 250 pounds of pork.

Although the use of lime, crop rotations, contouring, fertilizers, and manures markedly increased the yield of corn, these increases were limited by the amount of topsoil that remained. This emphasizes the necessity of initiating conservation farming while a good amount of topsoil remains. Although the yield data showed a close relationship between soil depth and yield in all fields, there were also striking contrasts in production levels as associated with management practices. The per-acre yields on those fields where proper use of land had been practiced and where soil amendments and simple conservation measures had been applied were much higher than on similar fields where little attention had been given to proper land use and conservation methods.

PRODUCTION IN THE CORN BELT

Production records for the Corn Belt show that we must depend upon more than increased cropland to guarantee the added production necessary to the victory program. Lack of farm labor and equipment makes it impractical greatly to extend our cropland, even if sufficient additional acreages were available. For example, in 1940 the cropland of Ohio, Indiana, Illinois, Iowa and Missouri—the five principal Corn Belt States—was 22 percent below the 1928-32 cropland. The acreages of oats and barley were down about the same. Soybeans had expanded, however, to take up about half of this reduction with the other half shifted to hay and pasture, or idle.

Fortunately, in the Corn Belt increased yields of crops more than offset the decreases in acreages. Corn yields in four of the five States were 20 to 30 percent above the 1922-31, 10-year average. The production of all important crops for the period 1938-40 averaged 10 percent above 1928-32. Grain production, including soybeans, was 5 percent larger; hay production, 31 percent; and pasture, 14 percent.

These data show the opportunity and also the responsibility of farmers in the Corn Belt to help carry out the Nation's war production program. While part of this increased production may be secured by cultivating new acres, the major portion of it must come from land already being cropped. This demands more efficient use of the land we cultivate and, certainly, it implies *conservation farming*.

We must expect, of course, that the extent of increased production will vary widely because of the tremendous diversity in physical factors, operational skills, and multiple conservation practices reflecting their influence on yields. Nevertheless, experimental data collected throughout the Corn Belt region, together with extensive observations made under widely different conditions, indicate that in spite of these variations the level of crop yields for the region can be increased at least 25 percent.

One of the most difficult problems immediately ahead of Corn Belt farmers is that of fitting the large increase in soybean acreage into rotations without inciting serious erosion. Sloping lands when cropped to soybeans are subject to serious erosion and for this reason the crop should be grown on the more level lands. The use of conservation farming for greater production therefore must be approached on an individual farm basis.

In general, total grain production can be increased by using cropping systems with a large proportion of higher-yielding crops on the more level fertile farms or fields, and by expanding the use of such conservation practices as liming, contouring, fertilizing and manuring on all farms. Furthermore, it has been shown that feed supplies can be made to go further in livestock feeding by giving more attention to feeding and sanitation practices. Land, labor, machinery and equipment are limited on most Corn Belt farms. Care must be taken, therefore, to see that each is used to the best advantage. In planning the activities for each farm the farmer must bear in mind that this increased demand for farm products will probably continue for a number of years.

According to *Agricultural Statistics*, in 1940 the average Corn Belt farm, in the five principal Corn Belt States, contained 129 acres with 66 acres devoted to cultivated crops and the remainder to pasture and timber, or idle. The acreages of different crops together with production for each farm in 1940 were as listed on page 179. The digestible nutrients were calculated for both the grain and forage.

Conservation farming on this average Corn Belt farm would call for a number of changes. In the first place the percent of the land in clean-tilled crops in 1940 was too large and did not provide for



Corn on the contour makes more corn on the cob.



Contour cultivation following a winter cover crop increases yield of lint and seed.



Kudzu is a great new triple-purpose crop. It stops erosion and rebuilds soil. It produces high quality hay. It supplies abundant pasture.



Hay makes meat and better farms.

essential crop rotation. The idle land was subject to active erosion and did not yield an income. Much of the pasture was weedy and was overgrazed because of lack of sufficient supplemental feed for livestock.

<i>Crop</i>	<i>Acres</i>	<i>Weight or quantity</i>	<i>Digestible nutrients, lbs.</i>
Corn	27. 1	1151.8 bu.	88, 169
Soybeans	3. 6	60.1 bu.	3, 463
Oats	12. 1	494.9 bu.	21, 561
Wheat	7. 2	161.5 bu.	12, 938
Hay	16. 0	21.4 tons	21, 440
Pasture lots and idle	48. 8	45.8 tons	45, 774
Timber	14. 2		
Total	129. 0		193, 345

Under the conservation plan of farming part of the corn and soybean acreage was shifted to idle or pasture land that was not subject to serious erosion. The crop acreages along with the production under the conservation system are shown below. The yields are calculated by assuming a 25-percent increase which according to experimental findings is a very conservative increase to expect.

<i>Crop</i>	<i>Acres</i>	<i>Weight or quantity</i>	<i>Digestible nutrients, lbs.</i>
Corn	21. 7	1152.3 bu.	88, 211
Soybeans	3. 6	75.2 bu.	4, 333
Oats	12. 7	636.3 bu.	27, 721
Wheat	7. 6	196.8 bu.	15, 773
Hay	20. 4	34.3 tons	34, 270
Pasture lots and idle	39. 8	46.8 tons	46, 800
Timber	14. 2		
Corn (new land)	5. 4	286.7 bu.	21, 951
Soybeans (new land)	3. 6	75.2 bu.	4, 334
Total	129. 0		243, 393

The added production of digestible nutrients on the average Corn Belt farm under the conservation plan of farming would amount to 50,084 pounds, or an increase of 25.9 percent. This additional supply of feed, if used to produce livestock, would be sufficient to keep four cows, four calves, and four heifers and to produce twelve 250-pound hogs. Under the conservation plan, all sloping land would be contoured; fertilizer, lime, and manure would be applied where needed; and all crop residues would be kept on the land. The acreage of clean-tilled crops would be increased only 3.6 acres per farm, and the land in rotated crops would be 9.1 percent greater than in 1940.

If conservation farming to the extent indicated above should be adopted by but one-half the farmers in these five Corn Belt States, the increased crop production, if used for growing additional livestock, would be sufficient to keep 2,202,380 cows



That terrible drought of '36 ruined the bluegrass but sweetclover carried on. Well-conditioned Herefords, assured of plenty of winter feed; a full silo; giant straw stacks attest the value of lusty legumes given a job to do.

averaging 1,000 pounds, 2,202,380 calves averaging 350 pounds, 2,202,380 heifers averaging 700 pounds, and 6,607,140 hogs averaging 250 pounds.

On 19 rolling farms in eastern Iowa in 1941 one or more uniform fields were divided into two parts; one part was planted to corn on the contour and the other part to the same crop not on the contour. Results of these tests showed that contouring alone increased the yield of corn 11.3 bushels per acre. The two parts of each field were treated identically in every other way. On the basis of these findings, the application of this simple conservation practice to one-half the corn land in these same Corn Belt States would produce sufficient additional corn for the livestock listed above, even if we assume the increase to be only about one-half of the recorded increase.

PRODUCTION IN THE COTTON SOUTH

Another area where farmers can further the food-production program is in the Cotton South. Census records show that half of the farm people of the United States live in 13 Southern States. In 1940 these southern farmers operated about one-third of the Nation's farm land and received only one-fourth of the cash farm income. Cotton has long been the crop that furnished the major cash income of the States of Alabama, Arkansas, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, and South Carolina. The marked increase in the urban population in these Southern States during the past 20 years is providing an expanding outlet for livestock and other food products.

Studies made of erosion in the South show that to

control this terrible waste the percent of the land in clean-tilled crops must be materially reduced. Experimental results show that crop yields can be markedly increased by practicing a conservation type of farming which includes proper land use, contour cultivation, soil amendments, utilization of crop residues, etc. Results of 3 years of experimental study at Athens, Ga., show that the use of a winter cover crop on continuous cotton increased the yield of cotton 23.5 percent. Cotton grown in a 2-year rotation with oats and cowpeas increased in yield 52.4 percent, while in a 3-year rotation with 2 years of lespedeza this increase was 83.1 percent. These and other experimental results, supported by extensive observations throughout the South, indicate that it is conservative to assume that the yield of cotton and corn can be increased 40 percent; oats, wheat, and hay 50 percent; and tobacco and soybeans 25 percent by applying conservation measures.

In 1940 the average cotton farm in eight of the Southern States contained 91 acres with 36 acres devoted to cultivated crops and the remainder in timber, pasture, or idle. The acreages under the 1940 plan of farming, together with the crops and digestible nutrients produced, are shown below.

<i>Crop</i>	<i>Acres</i>	<i>Weight or quantity</i>	<i>Digestible nutrients, lbs.</i>
Cotton lint	-----	2,605.9 lb.	Sold for cash
Cotton seed	10. 3	4,638.5 lb.	4, 221
Corn	16. 5	255.8 bu.	19, 533
Oats	1. 8	43.6 bu.	1, 898
Wheat	2. 3	29.2 bu.	2, 341
Hay	5. 1	5.0 tons	5, 000
Pasture	5. 0	3.5 tons	3, 500
Timber and idle	50. 0	-----	-----
Total	91. 0		36, 493

Obviously, a number of other important crops, such as peanuts, tobacco, sweetpotatoes, soybeans, etc., will continue to be grown on many farms in the South. The land acreage occupied by these crops would be deducted from that shown in the table as cropped to cotton and corn.

The changes in crop acreages together with the production to be expected under conservation farming are tabulated below. Production increases as calculated assume increases of from 25 to 50 percent as indicated above.

<i>Crop</i>	<i>Acres</i>	<i>Weight or quantity</i>	<i>Digestible nutrients, lbs.</i>
Cotton lint	-----	3,420.0 lbs.	Sold for cash
Cotton seed	9. 5	6,088.0 lbs.	5, 540
Corn	17. 5	379.8 bu.	29, 071
Oats	5. 0	151.5 bu.	6, 601
Wheat	8. 0	127.2 bu.	10, 193
Hay	13. 0	19.1 tons	19, 110
Pasture	15. 0	15.4 tons	15, 440
Timber and idle	23. 0	-----	-----
Total	91. 0		85, 955

The data presented show that under the conservation system of farming the pasture acreage would be increased from 5 acres to 15 acres, and the acreage of rotated cropland would be increased from 36 acres to 53 acres. The acreage of clean-tilled crops remains practically unchanged, but acreages of hay, small grain, and pasture would be increased by utilizing idle and sparsely wooded areas. This makes possible the very necessary practice of crop rotation and enables the farmer to keep more livestock, thereby increasing his cash income. Many farmers will elect to reduce their cotton and corn acreages and grow some peanuts, tobacco, soybeans, potatoes, etc., and thus make a larger contribution to the wartime food-production program.

Under the conservation system of farming, 49,462 pounds more of digestible nutrients would be produced than under the old plan of farming. This

represents an increase of 135.5 percent, which if fed to livestock would allow the farmer to keep added livestock amounting to three calves, five milk cows and three heifers, and to produce twelve 250-pound hogs.

If but half the farmers in these eight cotton States would practice conservation farming to the extent indicated, the increased production of crops over those produced in 1940 would feed for 1 year 4,258,765 cows, 2,555,259 calves, and 2,555,259 yearling heifers. In addition, 10,229,000 hogs weighing 250 pounds each could be raised.

From the analysis given of these two important agricultural areas, it is quite obvious that farmers do have both the opportunity and the responsibility in producing those crops and products that are so critically needed for winning the war. Similar results can be expected in other sections of the United States if needed adjustments in cropping and cultural operations are made.

Soil conservation districts have been organized in 42 States and are receiving Federal and State assistance in their planning and operations work. These districts are facilitating the application of factual conservation information to the land. They are in position to make effective use of those conservation practices that ensure immediate and continued increased production and thus help to meet the farm production goals needed to carry out our food for freedom program.

With the world almost completely embroiled in war, our soil has become a bulwark necessary to our existence more than ever before. While good land is always important, in time of war it is as essential as good guns and ammunition. This country has the land and resources to produce the food that will be needed to win this war and the peace that follows. Farmers who practice conservation farming, which after all is efficient farming, will make a major contribution toward winning the war.



Mixed pasture keeps hogs healthy, increases weights, lowers production costs.



Constant, intelligent control over water reduces erosion losses, cuts down expense, increases crop yields.

PRODUCTION REPORTS FROM IRRIGATED LANDS

BY FRANK KIMBALL¹

CONSERVATION irrigation practices accounted for much of the vast tonnage of food and fiber products grown in the Western States during 1942, and will undoubtedly occupy an increasingly important place in western crop history of the future.

In planning for the necessary increases in agricultural production to meet wartime demands it is logical that irrigated areas should receive special attention because crops grown under irrigation are not greatly affected by climatic influences, production rates per acre are high, and the increases can be obtained in relatively short intervals of time. Many irrigated areas could materially increase their crop yields through the use of more efficient irrigation practices; in some instances increases of one-third could reasonably be expected.

Extension of existing irrigated areas and development of new irrigation projects is definitely limited by the availability of water supplies, and this factor serves to emphasize the necessity for exercising proper control over irrigation water. This includes management and control of watershed areas and streams, as well as the structural works necessary to get the water to farms. Most important of all, it means control of water during its application to crops. It is also necessary to understand that generally irrigation problems are of a group or community nature, and that of the thousands of existing irrigation enterprises, each is more or less peculiar to the lands which it serves. Entire communities are built around the irrigated areas and the tax base in many agricultural communities is dependent mainly upon the values of irrigated lands

and irrigation systems. *The livestock industry in the West receives about one-half of its feed supplies from irrigated lands.*

Soil Conservation Service technicians find that the problems confronting them in irrigated areas generally can be classified in one of the following categories:

1. Land in need of conditioning and improved irrigation and farming practices.
2. Improvement or construction of farm distribution systems.
3. Improvement or construction of water supply systems serving single farms, or groups of farms.

The main purpose of assisting farmers and irrigation enterprises in solving these problems is to enable irrigators to apply water to crops at the right times and in the right amounts to help ensure the permanency of profitable crop production.

Since irrigation problems are largely of a group or community nature, they are solved most effectively and efficiently when the group or community has a mutual understanding of such problems and when the people work together with a clear knowledge of the facts and objectives. At the present time there are approximately 1,000,000 acres of irrigated lands in soil-conservation districts in the 17 Western States. Many irrigation enterprises are finding that this type of organization is admirably suited to assist them in solving their group and individual problems.

The following examples, taken from field reports of the Portland, Oreg., and Albuquerque, N. Mex., regional offices, are presented below to indicate the kinds of assistance the Soil Conservation Service has given to hundreds of individual farmers and

¹ Head, Irrigation Section, Engineering Division, Soil Conservation Service, Washington, D. C.

irrigation organizations in these Western States:

1. An orchardist near Yakima, Wash., was having severe erosion, with declining production, on his cherry and apple orchards as a result of irrigating steep clean-cultivated slopes. Technical assistance enabled him to develop an excellent cover crop and mulching program and to use sprinklers operated by a booster pump from the irrigation canal. Since installation of these practices, yields have increased from 10 to 25 percent and the quality of fruit is approximately 50 percent better. Water is being conserved and erosion is being controlled. This orchardist has learned that conservation on irrigated lands pays dividends.

2. A farmer living 3 miles northeast of Ellensburg, Wash., had been irrigating a 40-acre alfalfa field with wide-spaced furrows approximately 1,200 feet long. The lower 10 acres of the field were waterlogged from excessive surface and subsurface irrigation water. With assistance of Soil Conservation Service engineers, the farmer installed three additional head ditches, reducing the run to approximately 330 feet. An interception drain was installed above the waterlogged area. The 10-acre field was dried up and is now producing good crops, and the entire field is now being irrigated with less work and less water than formerly. The cost to the farmer was approximately \$200 and increased production is not less than \$300 annually.

3. A dairy farmer in Spokane County, Wash., was finding operations on a 160-acre dryland farm financially difficult. A small creek could furnish 150 gallons of water per minute to the farm. With the assistance of Soil Conservation Service technicians, a sprinkler irrigation system was installed to irrigate 40 acres. The farmer increased his dairy herd from 12 to 20 cows, increased butterfat production per cow, produced all hay and silage needed, and produced cash crops in a dual type of enterprise. The cost to the farmer was \$1,500. The annual returns from the farm were increased from \$1,200 to \$2,000 per year.

4. A beet producer in southeastern Idaho was finding it difficult to irrigate his hundred acres of beets with the available water, using 1,200-foot runs. With engineering assistance supplied through the Oneida Soil Conservation District, the runs were shortened to 400 feet. As a result, one less irrigator was required. Due to more even water distribution the best yield was increased from 12 to 17 tons per acre. In this instance conservation didn't cost—it paid!

5. An irrigation district in southern Idaho was faced last year with a water shortage because the pumping plant was inefficient. Plans and specifica-

tions were prepared by Soil Conservation Service engineers for improving the wells, procuring new pumps, and lining a leaky canal. Further assistance was extended in securing a priority rating so that the equipment could be purchased. As a result of this improvement, and at a cost of only slightly over \$6 per acre, nearly 1,700 acres of land now have a dependable and efficient irrigation system.

6. Near Walnut Creek, Calif., several farmers irrigate walnut orchards from wells. The ground water table had been declining until the irrigation systems were jeopardized and pumping costs excessive. By placing some stop-log check dams in an intermittent stream, the ground water supply has been replenished and pumping costs reduced. The cost was insignificant as compared to the benefits derived.

7. Contour planted potatoes in a demonstration on the Kittitas project in Washington showed decreased water use, improved quality of potatoes, and reduced soil erosion, when compared with down-hill plantings on land with slopes of 5 percent to 8 percent.

8. Anticipating a shortage of water during the irrigation season of 1942, Lloyd Taylor of Red Mesa, Colo., a farmer, requested assistance last spring from the Soil Conservation Service in rehabilitating his irrigation system. SCS technicians located lines for laterals on 301 acres, shortening runs and arranging for the "pickup" and reuse of what ordinarily would be waste water.

Results of this work are apparent in Mr. Taylor's statement after harvest of this year's crop. "Due to more efficient use of my limited supply of water, I was able to grow a full crop on the whole 301 acres, whereas under the old system of irrigation only 150 acres could have been watered, and I would have had a complete failure on half of this acreage."

The result is 4,500 bushels of small grain saved for national war needs by application of conservation practices.

9. In the Safford Valley of Arizona, farmers have found the dollars-and-cents benefit of improved irrigation practices. On the Charles F. Watson farm, terraces and concrete drops on irrigated fields are credited by the farmer with having doubled his production.

On M. J. Ferguson's farm, terraces and concrete drops for surplus water disposal have enabled him to irrigate with one-third less water, have increased production by about one-third, and cut his irrigation labor in half. In addition to his increased income and more efficient operation, the improved irrigation system has helped check serious soil washing that already had destroyed about 50 acres.

10. The Whitewater community in Mesa County, western Colorado, is finding that revamping of its irrigation system is putting the farms of the vicinity on the road to new stability and better operation.

The community is served by one of the oldest irrigation ditches in Mesa County—a ditch that was built in 1882. Over the years a number of problems have developed which mounted up to more of a burden than local residents could cope with. The diversion dam intake and headgates were a constant source of trouble. Floods frequently took out the brush and rock diversion structures and debris lodged in headgate structures to cause loss of water until repairs or cleaning operations could be completed. Division of water was a source of difficulty, and application of water presented a variety of problems.

When the local people formed the Kannah Creek Soil Conservation District, one of the first jobs tackled was that of working over their irrigation set-up. Soil Conservation Service technicians recommended a new concrete diversion dam, headgate and division box. The application of irrigation water to the farm lands still remained the big problem, however, and after considerable study, the district and SCS hit on a system they believe will be the solution to the irrigation problems of the community. Although the border method had never been tried there, it was believed that it would prove advantageous.

A farmer, whose best piece of land was so flat he had not attempted to farm it for 14 years, agreed to try the new system. Eight acres of land were prepared and bordered, and the first application of water proved successful. It indicated at least two important advantages of the border system over the old corrugation type of irrigating in that area: The border system requires only one-half the time to irrigate the same amount of land, and there is no water wasted. Now, with interest aroused, the soil-conservation district is advocating that all farmers in the Whitewater community adopt this border method, even though it involves a radical change in present irrigation practices.

In the past, in this community all farmers had varying heads of water with which to work, ranging from 2 to 67 miner's inches of water. For the border method, it is being recommended that they all pool their water and rotate the use of it. This in itself will eliminate many of the inconveniences of the corrugation method in which it is common practice to receive a definite amount of water—say 57 inches—and use that amount day and night the entire irrigation season. Irrigation "sets," under the old system, are made at 8 o'clock at night and

not changed until 6 o'clock the next morning. This usually results in over-irrigation and water waste.

Under the border method, a large irrigation head is applied at one time, which may require a 48-hour irrigation period. But when the next person takes the water, the first farmer is relieved of irrigating until his turn comes around again—say 2 or 3 weeks later.

The border method is an innovation in the White water community, but if it works out as well as it appears to have started, it should prove to be a great benefit to the area in terms of more efficient irrigation and improved crops and yields.

11. After 26 years of uncertain farming and gardening without irrigation water, the residents of Cabezón, N. Mex., are happy over their achievement in getting water for their lands this spring.

Wishing to cooperate with the Government in its Food for Victory program, Cabezón residents, early in 1942, under the leadership of B. P. Hovey, secured permission to use the excess water of the San Luis community ditch, which had been rehabilitated as a Water Facilities project in 1941. They also arranged with the State Engineer for the declaration of their water rights.

An agreement was drawn up and signed which provided for the Soil Conservation Service to furnish engineers for surveying, designing, and supervision of reconstruction for the 7½ miles of ditch and a 125-foot flume across the Balcon Arroyo. The Soil Conservation Service also loaned the community a caterpillar tractor and a 10-foot grader which in 20 days constructed the ditch and a number of the distribution laterals. The Farm Security Administration loaned farmers the money to pay the tractor operator. Through the Grazing Service and the Sandoval County Commissioners they were able to secure funds for the purchase of fuel oil for the tractor and to do their trucking. They purchased an old railroad bridge which provided piling and heavy timbers for construction of the flume and necessary road bridges. The New Mexico Timber Co. donated the lumber, nails, and roofing paper for the flume. The Bernalillo Mercantile Co. donated the cement needed.

All those who expected to make use of the water contributed their time, teams, and such equipment as they had, and by working early and late the system was completed and the water turned into the ditch on May 10. When the water arrived at Cabezón there was great rejoicing. It is reported that some of the women wept for joy and the older men reported a funny feeling in their stomachs!

The cooperative spirit shown by the thirty or more families in rehabilitating the irrigation system



Irrigated pastures are a factor in the accelerating drive for food.



Water has played an important part in the winning of the West. Now it is destined to play an important part in the winning of a war.

destroyed 26 years ago by erosion in the Rio Puerco watershed, which will provide water for approximately 600 acres of valley land, is an outstanding example of "democracy" at work.

12. Rehabilitation of 20 ditch systems in the vicinity of Trinidad, Colo., recently has saved the production of about 30,000 acres of irrigated land.

In April 1942 a flood on the Purgatoire River washed out all diversions serving this farming area, valuable, among other reasons, for its sugar-beet crop. If this crop were to survive, irrigation facilities had to be reestablished within 3 weeks.

Emergency assistance in replacing the irrigation diversions and headings was given by the Soil Conservation Service, Forest Service, and Bureau of

Agricultural Economics. Water was in the ditches in time to save the sugar beet crop.

From the foregoing examples it is readily seen that the degree of success obtained in interesting irrigation farmers in adopting sound water-use and agronomic practices quite often depends upon the repair or construction of the physical works necessary for the operation of their irrigation enterprises. The demands for such improvements will be governed mainly by the financial status of the enterprise, value of irrigation water, and the kind of crops grown.

(Continued on page 188)



Good pastures and good cattle mean more food with which to wage successful war. W. R. Cutrer and J. B. Cutrer, father and son members of the Bogue Chitto-Pearl River Soil Conservation District, saw milk production climb from an average of 275 pounds per day to more than 600 pounds when their 30 cows were turned in on clover-Dallis grass pasture last spring. After 40 days the cows were taken from the pasture so that the clover seed might be harvested. Later they were returned to the pasture to graze Dallis grass.

WAR-NEEDED PASTURES REPLACE KING COTTON

BY CHARLES G. WEBB¹

PART of the pattern for a New South is in the making in the Florida parishes of Louisiana, and the dominant design is grassland agriculture. One-cash-crop farming that has ruined so many southern farms is going out of the picture.

Soil-conservation districts are pointing the way toward this new agriculture with limestone, superphosphate, and muriate of potash, and with hop, white and Persian clovers, and Dallis grass. Under guidance provided by the districts, farmers are spending \$15 to \$25 per acre to build soil-holding, soil-improving, milk- and meat-producing pastures. They report that the entire cost is returned to them within grazing periods of 3 weeks to 6 months by increased milk production and reduced feed bills. Bank President J. M. Breeden of Greensburg, La., believes fine pastures are such good investments for farmers and his community that he is urging other

landowners to place more land in clovers and grasses.

Poor land at first, and now good land, is being converted into pastures as farmers turn their backs on the old style one-cash-crop farming system. Some land that had been in cultivation a hundred years or more—land that had seen the rise of King Cotton and had grown thin and weary under his tyranny—is now carpeted with a mixture of palatable, nutritive forage plants from 8 to 10 months each year.

This change from cotton-and-corn agriculture to diversified farming through scientific soil-conservation methods is completely in harmony with our wartime food-production program. Milk and meat are high on the "must" list of foods necessary to keep us working and fighting.

W. E. Dee is the agronomist whose recommendations were followed in developing these high-producing pastures. Bill Dee is a district conserva-

¹ Information specialist, Western Gulf Region, Soil Conservation Service, Fort Worth, Tex.

tionist of the Soil Conservation Service assigned to the Bogue Chitto-Pearl River and Feliciana Soil Conservation Districts. Good pastures are Dee's pride and joy—pastures that hold soil, pastures that produce milk needed in the war effort and put a jingle, jangle, jingle in farmers' overalls. These two districts cover all or parts of Washington, St. Tammany, Tangipahoa, St. Helena, East and West Feliciana, and East Baton Rouge Parishes, the so-called Florida parishes of Louisiana.

The entire treatment of the land before clovers and Dallis grass are planted, and the use afterwards, is shaped to supply the needs of the legumes and grasses to be grown. In nearly every instance, soils are tested in the soils laboratory at Louisiana State University to determine what plant nutrients are limited or lacking, and what quantities of fertilizers should be applied to make available the necessary plant foods and to provide a favorable environment. More humus usually is required, and one of the first steps in the pasture development is to plow under a green-manure crop, preferably a legume; or to plow under crop residues; or to add animal manures—or to use a combination of these methods of adding organic matter to the soil. Both cowpeas and crotalaria have been plowed under as green-manure crops.

Treatment used on the D. H. Gill farm in Tangipahoa Parish is typical of the methods followed in establishing clover-Dallis grass pastures. Following the harvest of oats in the spring of 1941, the field was disked and planted to a mixture of 10 pounds of *Crotalaria spectabilis*, scarified, and 1 bushel of cowpeas per acre. These legumes were plowed under green in September, and 1½ tons of dolomitic limestone was applied per acre. After a rain fell, 200 pounds of 48-percent superphosphate per acre was harrowed in. During the first week of November, a mixture of 10 pounds of hop, white, and Persian clovers in equal parts by weight and 10 pounds of Dallis grass per acre was sown. Later a top-dressing of 100 pounds of 50-percent muriate of potash per acre was applied.

White and Persian clovers usually come into grazing at about the same time, and the hop clover comes in last. Toward the end of the grazing season, hop clover generally matures and dies first, Persian next, and white clover last. White clover usually lasts 4 to 6 weeks longer than hop clover, and 2 to 4 weeks longer than the Persian. One of the advantages of hop clover is that it gives more and better grazing than either of the other clovers on sites where fertility and organic matter are low.

Dee said he has observed that this combination

of clovers has a tendency to reduce bloating of cattle, as compared with stands of pure white clover. However, he warned that the combination "is not a cure-all for bloat."

Dallis grass begins to appear when the sun reaches the soil through gaps made in the stand by the death of hop clover plants. As more and more clover plants die, more and more Dallis grass comes up to provide summer grazing.

First year seeding of hop, white, and Persian clovers usually provides grazing from March 1 to June 1. After the first year, these clovers usually may be grazed from January until May 15 or June 1. Some of the second-year pastures in the Bogue Chitto-Pearl River Soil Conservation District were being grazed November 24, 1942; some were expected to be ready for grazing by December 15, but others were not to have cattle on them until January 1.

In order to permit the clovers to reseed, cattle must be taken from these pastures when the clovers are in full bloom, usually from May 15 to June 15. As a means of providing necessary grazing during this seeding period, supplemental pastures of lespedeza and Dallis grass are planted in February or March. Alyce clover (*Alysicarpus vaginalis*) performed so well in 1942 that it will be used in several plantings next spring in lieu of lespedeza. Alyce clover makes most of its growth during late summer and fall months.

Dee frequently refers to the clover-Dallis grass pasture as No. 1 pasture, and to the supplemental pasture as No. 2 pasture. He recommends that an equal amount of each type of pasture be established on each farm. From experience he has learned that 1 acre of the clovers will carry as many animals from January to June 1 as two acres of lespedeza and Dallis grass will carry during the summer and early fall months.

Some of the advantages of having two types of pasture, in Dee's words, are these: "By having the No. 2 pasture, the No. 1 pasture is permitted to make a good crop of clover seed. The Dallis grass is permitted to get a good start in the No. 1 pasture, and after the No. 2 pasture is grazed down, the cattle are put back in the No. 1 pasture. Cattle then are alternated between pastures until the time of glean-ing cultivated row crops in the fall."

Any grazing chart or schedule would be subject to the variables of weather, soil types, soil fertility, and organic-matter content of the soil. However, an approximation of the use to be made of these pastures and gleanings from cultivated row crops would be: January to June 1, pasture No. 1; June, pasture No. 2; July, August, September, and part of October, both pastures; remainder of

October, November, and December, gleanings from cultivated crops.

Much of the land now going into pasture lost between 25 and 75 percent of the topsoil while in cultivation, and some of it even more than 75 percent. Well-managed good pastures control erosion and help build new topsoil.

Farmers probably have reasoned that if good pastures can be built on the poorer land, even better pastures can be made on the best land. Thus on many farms good land is going into pasture. Charles Schwartz of Kentwood is putting to pasture 5 acres of land that have produced as many as 8 bales of cotton. H. A. Kennedy of Angie has 34 acres from which he has harvested as many as 40 bales of cotton in one fall, but he is putting 10 acres of this land in clovers and Dallis grass.

This change from the old cotton-and-corn agriculture is being made in the face of the best prices in years for cotton and corn. On the other hand, milk, and beef prices are good, and both are vitally needed wartime foods. And the pastures require less labor.

Dee reported that 172 farmers in the two soil-conservation districts established clover and Dallis grass pastures in the fall of 1941 on approximately 1,700 acres.

One of these farms is operated by M. S. Daugherty and his son, M. S. Daugherty Jr., near Lindsey in the Feliciana Soil Conservation District. Before planting a 30-acre pasture, the Daughertys distributed 100 pounds of 48-percent superphosphate, 75 pounds of 50-percent muriate of potash and approximately 1 ton of lime per acre. When the Daugherty herd of 55 cows was placed in the pasture last spring, milk production rose from an average of 110 to 130 gallons per day. In order to obtain a seed crop, the cows were taken out of the clover pasture after 25 days of grazing. The Daughertys, who were receiving 14 cents per quart for milk, estimated that the clover pasture increased their gross income \$11.20 daily during the 25 days of grazing. Two-thirds of the clover-seed crop was lost because of rain, but the one-third successfully harvested from the 30 acres was sold for \$1,000.

Willie Crow, in Washington Parish, planted 3 acres to clover and Dallis grass in 1941 at a cost of \$45.75 for seed and fertilizer and \$8 for labor, or a total of \$53.75. The entire cost was repaid during the first 3 weeks of grazing after 16 cows were placed on the pasture March 25, 1942. Milk production rose 75 pounds per day, and the feed costs were reduced materially.

Lee Ezell, operator of a 55-acre dairy farm at Franklinton, retired 10 acres of cultivated land to

clover-Dallis grass pasture at a cost of \$18.20 per acre in the fall of 1941. In terms of reduced feed bills and increased milk production from 20 cows, the pasture was worth \$35 an acre during the first 50 days of grazing last spring.

After visiting several of these "made" pastures in Tangipahoa Parish, Banker Breeden of Greensburg sent letters to his farmer-customers calling their attention to this phase of the soil-conservation district program. He wrote as follows:

"The total cost ranges between \$15 and \$25 per acre, or an average of about \$20 per acre, depending upon the type of soil, but it is my opinion that if the advice of the county agent, the AAA parish administrative officer, Soil Conservation Service workers, and other agricultural agencies is followed closely, you will be more than pleased with the results. It may seem strange to you to get a letter of this kind from a banker, but we realize that the bank can prosper only when our customers and the entire community are prosperous."

So much enthusiasm has been aroused for these good pastures that many additional farmers were establishing clover and Dallis grass pastures in the fall of 1942. Dee estimated that approximately 4,000 acres were going to pasture. At least 112 district cooperators were establishing improved pastures for the first time. In the Bogue Chitto-Pearl River District alone, district cooperators ordered 25,000 pounds of a mixture of white, Persian, and hop clover seed, and 25,000 pounds of Dallis grass seed.

PRODUCTION REPORTS FROM IRRIGATED LANDS

(Continued from page 185)

During the present war emergency all construction activities involving the use of scarce materials must necessarily be limited to works of very high priorities. Meanwhile, temporary types of irrigation structures made with local supplies of rock, earth, logs, and like materials may afford very satisfactory substitutes for permanent works. In general, the needs for structural work might be materially reduced on most irrigation enterprises by improving or intensifying regular maintenance activities, and the widespread adoption of more efficient and economic uses of water. The present shortage of farm labor and of equipment replacements also serves to emphasize the needs for careful farm planning whereby the way is cleared to increased production through conservation farming.



BOOK REVIEWS AND ABSTRACTS

by Phoebe O'Neill Faris

CONSERVATION OF NATURAL RESOURCES.

By George T. Renner. New York and London. 1942.

Without people who look far into the future of our country we would have no great conservation movement today. Because it will be the same in another generation, and another and another, education of the youth of the present in ways to use and at the same time preserve our resources is our most important problem. It is disconcerting, to say the least, to talk with a man who for several years has taught a rural school of some 75 farm children and to discover that he never heard of the Soil Conservation Service or a soil-conservation district, and thought soil conservation meant taking the land out of cultivation and getting paid for it.

Such a talk I had a few months ago, with such a teacher; and since that time I have been looking for books especially suited for use by teachers and pupils who need to "catch up" with the idea of conservation as well as the immense conservation program now working as a part of our general social and economic system. This book is such a book, in my opinion, chiefly because it is not written and compiled from the viewpoint—or vantage point—of any Government administration or agency, any group of officials, or any publicity scheme. It is a teacher's text, by a teacher—a teacher getting down to the business of organizing conservation subject-matter so that it can be presented to the pupils of all schools as a basic theme of all subjects in any way related to our natural resources. The author is professor of geography of the Teachers College of Columbia University, and consultant to the United States National Resources Planning Board.

As Professor Renner states, "A new human geography is in the offing; new economic, social, and civic viewpoints must be brought to the American people. The possibility of conserving their national heritage of resources must be taught to every man, woman, and child in the country." As the war is teaching us more rapidly than we could have imagined only 3 years ago, this is gospel truth—it is truly amazing that it has taken us so long and so tragic a road to recognize it. The first three chapters of Professor Renner's new book for teachers shows quite clearly why the evolution of conservation thinking has been so slow a process in our country, and why it is that now an active conservation program demands the attention of all citizens and of our entire public school system in particular.

An excellent conservational classification of resources is presented, in outline form, in chapters 6 to 8 inclusive. Six classes of resources, with a remedial program for handling each, are given simple treatment that should start any grammar school pupil to thinking and lead young minds onward toward an understanding of personal responsibility in public affairs. One cannot but feel that Professor Renner, in planning his book for teachers, had some hope that the teacher might put this part of the volume directly into the hands of the pupils.

The Teacher's Forum, at the end of each chapter, is brilliantly planned and arranged to accomplish the end in view—

to guide the teacher and the student to an understanding of the fact that the Nation cannot continue to be great and powerful and free if it continues to destroy the bases of its future existence by wasting its resources, including its people. It is not going to be easy to get school children to think of themselves as one of the Nation's resources. They must be shown that upon the quality of their mentality depend not only their own lives and happiness as individuals, but the greatness and safety of the country as well.

This new book will go a long way toward supplying teachers of city and rural schools with a manual for teaching conservation. Each of the 9 chapters of part II provides an outline of a course in conservation of one of the natural resources. Soil, water, minerals, forests, range grassland, wildlife, recreational resources, and human resources are all treated separately as to their origin or nature, the conservational problems concerning them, and remedial measures including many that will appeal to the pupil as his own personal part in a permanent conservation program. The chapter on conservation planning, at the end of part II, is especially important because it points out very clearly the reasons for community planning to supplement national planning if we are to safeguard the future of our democracy.

Part III is for the teacher and the student-teacher in training. Its four chapters are devoted entirely to the curriculum, methods for organizing a course of study in conservation, and the local materials, both rural and urban, for initiating the course and carrying it through in such a way that it will become a permanent part of the teaching philosophy and the school as an organized institution for the safety of our Nation.

All chapters include teacher's bibliographies listing outstanding publications available to teachers. In addition, a section of the chapter on general materials for conservation education is given over to textbooks, student and teacher reference material, visual materials including maps, graphs and films, and agencies within the United States whose principal concern is conservation of national resources.

SAGA OF THE CCC. By John D. Guthrie. Drawings by Marshall Davis. American Forestry Association, Washington, D. C. 1942.

A theme-song, "All Over America," sings across the pages of this Saga. It is a souvenir book, in blank verse, by a man who knew CCC boys—all over America—from the beginning in 1933. The artist who made the drawings was himself once a CCC enrollee, and he has "caught" the boys at work in America's fields and forests, under their tents, dreaming their dreams, learning to be good farmers, good technicians, good soldiers.

Major Guthrie's verse is good; it flows along happily, then becomes vivid and dramatic, ends with "taps" for "Uncle Bob" Fechner, Director of the Corps for 6 years.

We of the Soil Conservation Service have happy and grateful memories of the CCC, and this little book will serve as a keepsake, to be taken up and read and reread



BOOK REVIEWS AND ABSTRACTS

by Phoebe O'Neill Faris

so that we shall not forget the boys of the Corps who "put in millions of hours in conservation," threw up earth dams for us, set young locust trees for us, filled and levelled gullies for us, helped us get going with soil conservation "All over America." They are now soldiers, these boys, fighting for our country.

ECONOMICS OF SOIL CONSERVATION. By Arthur C. Bunce. The Iowa State College Press, Ames, Iowa. 1942.

This new study of the economic aspect of soil conservation will start many an argument—and no doubt it will serve to end some arguments already nearing the rebuttal stage. It has been said that when a definitely moral or ethical movement reaches the point of being a subject for debate as to its economic repercussions, then and then only does it become a permanent part of our national life.

The soil-conservation movement in the United States sailed right into the field of economics some time ago and now rides the waves of our wartime production policy with flags flying. Dr. Bunce, author of this new volume, has had no small part in carrying through some extremely important studies to determine the economic effects of planned conservation on the individual farm and farmer in Middle Western areas. His book is an analysis of factors that must be considered in deciding whether or not it is economic, from the point of view of both the individual and of society, to expend labor and capital and planning effort to build up or improve or reclaim land that has reached a state of deterioration through exploitive farming methods.

What these factors are, and how they should be assembled and measured, constitutes the thesis of the book which, by the way, is dedicated to the Chief of the Soil Conservation Service. Price and land-value fluctuations; social upheavals resulting from severe soil losses; agricultural, industrial, and even trade changes as related to used-up virgin fertility of soil; changing labor costs; national or local emergencies affecting social welfare—these are a few of the broader aspects which are discussed and pointed out as exceedingly important in forming a national land preservation policy that will serve to meet widely fluctuating needs over long periods of time.

A somewhat different set of factors must be considered, according to Dr. Bunce, in the matter of conservation plans for individual farms. These factors depend greatly on whether the farm land is eroded so that it needs repair measures or shows only fertility depletion to such an extent that its productive capacity is lowered. They are concerned chiefly with the individual's ability to weather the period of adjustment to the conservation plan. In the chapter, *Society and Conservation*, the author balances the two sets of factors as an approach to the problem of social control over land use, through education, demonstration projects, prices, subsidies, property rights, taxation, public ownership, police power, and zoning.

In the last three chapters of the book, Dr. Bunce assembles

his factors, both tangible and intangible, and coordinates them into lists of "estimates necessary to determine whether conservation is economic." The chapter entitled *Problems of Measurement in Conservation Planning* is one that will stop and start arguments, but undoubtedly it should be read by all who now realize that, as Dr. Bunce expresses it, "We have now reached a transition period in our economic and social development." The final two chapters of the volume are on war and conservation, emergency conservation planning in the war production program and a post-war adjustment period, and formulation of public policy to ensure us a flexible and sound soil conservation program as a safeguard to our agriculture.

AGRICULTURE IN THE PHILIPPINES

Cultivation is hazardous in the Philippines because slopes are steep, rainfall is heavy, and soils are highly erodible. The short rivers with steep gradients carry heavy loads of material eroded from intensively cultivated slopes.

On Negros and Luzon cultivation of sugarcane has been rapidly depleting the soils. In the interior of Cebu, soils have been eroded beyond reclamation. But cultivation can be carried on in the Islands under proper management. In Davao, abacá is cultivated on thousands of acres protected against erosion, and on one rubber plantation in Mindanao soil-conservation methods have been practiced for a decade.

Good management and mismanagement of land is illustrated on the cultivated grassland areas in the Bukidnon region of Mindanao. Large quantities of first-class pineapples are produced on this soil in fields cultivated across the slope, provided with cross-slope ditches for removal of excess rainfall, and protected by green manure crops after the pineapples have been taken off. The productivity of the same soil cultivated with a light-weight plow and put in corn or rice repeatedly, two or more crops each year, is rapidly declining.

It is reported that Japan plans to devote a million acres of land in the Philippines to cotton. Before the invader came, the story told by good and poor land management was written on the face of the land.—Adapted from *Geographical Review*.

Selection of right pasture mixtures and controlled irrigation and management have turned a 20-acre field which was too wet for crops into a profitable part of his farm, William Boyd, farmer in the Pavillion soil conservation district near Riverton, Wyoming, reported recently.

For REFERENCE

Compiled by **ETTA G. ROGERS**, Publications Unit



Field offices should submit requests on Form SCS-37, in accordance with the instructions on the reverse side of the form. Others should address the office of issue.

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¹ From Superintendent of Documents, U. S. Government Printing Office, Washington, D. C.



THE LAND AND ITS BOUNTY

A full basket—health for fighters—comes of healthy land.

No happenstance can deal with the hunger of the United Nations. No farming by chance can build sure victory.

Land-ripping is thoughtless and expensive and inadequate.

Behind the harvest must go all the skill and intelligence of American husbandry at its topmost best. Behind the smile of achievement must go the sweat and toil of an enlightened, determined people. Farm planning—properly disciplined and directed soils—is the only certain route to goals.

Here in this picture of an attractive, well-nourished farm lassie holding an exhibit of mineral-rich, vitamin-strong vegetables against a background of orderly, strip-cropped acres is the whole portrait-in-miniature of the conservation-production idea.

Major task before the Nation's agriculture is the country-wide enlargement of this miniature. The job is to reach every farm with the urgency of contouring, of grassed waterways, of strip-cropping, of terracing, of using the land in harmony with Nature's own scheme. Do these things in 1943, and a harvest such as this country has never seen before will fill the warehouses and load the ships and reach democracy's millions in quantities that will constitute a guarantee of triumph.

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WELLINGTON BRINK
EDITOR

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A poor drainage ditch caused this flooding in May. A poor crop followed.

FARM DRAINAGE TO INCREASE WARTIME PRODUCTION

BY JOHN G. SUTTON¹

NOW, AS NEVER BEFORE, we need to examine the agricultural problems on which the Service is

¹Head, Drainage Section, Engineering Division, Soil Conservation Service, Washington, D. C.

working, study the nature of each, and adjust our program with one objective in mind—to help win the war through improved conservation designed especially for increased production.

A good drain permits use of rich bottom lands formerly too wet to farm.



Drainage is recognized as one of the conservation practices that will increase agricultural yields rapidly and effectively. Some essential drainage projects are being or will be undertaken. Others that require too long for development, or too large an expenditure of labor, equipment, and materials should be deferred until after the present war emergency.

General Drainage Picture

According to information now available, 24,600,000 acres of the lands now in organized drainage enterprises, and 6,400,000 acres outside drainage enterprises are poorly drained and are in need of improved outlet facilities or other rehabilitation and repair work. This 31,000,000 acres of land is limited only to the poorly drained cultivated land having a high inherent fertility and which is now cultivated or partly cultivated. This land does not include any swamp land not already developed into going farm units. The totals mentioned above refer only to land in need of improved outlet drainage. Proper farm drainage is equally important along with outlet drainage systems. Generally the two problems are closely associated, poorly drained lands generally requiring improved farm drains as well as better outlets. Only in a minority of cases will either improved outlets or improved farm drainage, alone, remedy a bad drainage condition.

A large amount of this land in need of improved drainage is in midwestern States, and when properly drained is among some of the most productive land in the world and is capable of producing high returns. Another large amount of this land is located in the southern States. The drainage of this would produce more feed and increase production of beef, milk and pork and also increase production of critical crops such as soybeans and peanuts. There are large acreages of poorly drained land in the South capable of making a contribution to wartime production and helping to solve many post-war problems through improved drainage. Throughout the country improved drainage is especially necessary to the increased production of meat, milk and eggs because flat bottom lands produce such a substantial proportion of feed crops.

Improved drainage is an important conservation measure because drained land is generally the flat land not subject to severe erosion. It is the land most generally adapted to intensive cultivation. An important conservation principle is to encourage maximum use of nonerodible land and to reduce intensity of use of eroding lands.

In general, these drainage problems may be divided into three classes on the basis of an individual job analysis:



The poor outlet drain above, a sort which results in waterlogged farms, is shown again, below, after rehabilitation.



1. Drainage projects essential to the war effort which can and will be financed by farmers and landholders without governmental assistance.
2. Drainage projects not essential to the war effort and which should not be undertaken as war-time projects.
3. Drainage projects essential to the war effort which could be undertaken only with varying degrees of Government assistance.

Farmers and landholders are undertaking to solve and will continue work on problems on their farms which fall within class 1.

Some drainage projects must be submitted to the War Production Board for prior approval, but other jobs are exempt from this requirement. On all operations, applications must be submitted where priority assistance is needed to secure critical construction materials. Excavation requiring no processed materials and tile pipe lines of clay or non-reinforced concrete tile drain not more than 12 inches in internal diameter are exempt from prior approval. Repair and maintenance work is also exempt. Structural work classified as "other restricted construction" must receive prior approval if the job is over \$1,000. In case of doubt, information should be secured from the War Production Board.

The Service is especially concerned with the class 3 drainage projects—those essential to the war effort, but which will be undertaken only with varying degrees of Government assistance or encouragement. The AAA program is now allowing payments for drainage work in some States. This is a comparatively recent development following the emphasis on increased production of many agricultural products and it should encourage the improvement of many farm ditches. The soil conservation districts, with the assistance of the Soil Conservation Service, are making good progress in applying farm drainage practices as a part of a complete farm conservation program.

In spite of these encouraging developments there still remains a tremendous acreage of poorly drained agricultural lands. It should be a matter for more general concern and interest that there is such a large amount of poorly drained land which farmers are attempting to farm, and which is yielding a poor return. These conditions result in waste of labor, seed and equipment. Yield of critical crops and agricultural products is much less on such land than if the land now under cultivation were properly drained. By remedying these conditions a substantial contribution toward increased production would result.

To qualify as a wartime project, a drainage project should meet certain requirements. The increase in production resulting from the project should be secured without delay, and to justify the project the ratio of benefit to cost should be high. The primary purpose of the wartime drainage project should be to increase production on lands already in use, or to permit use of land on or near an existing farm unit without expenditures for additional farm equipment and buildings. Reclamation projects requiring development of new farm units should not be undertaken. The principal crops or products grown should be critical to the war effort. The increase in critical crops during the first crop season should compare favorably with the value of critical materials expended on the project.

The availability of labor, equipment, and materials are of fundamental importance. Labor in the vicinity of war production centers and in other areas is very scarce and because of this problem large projects are out of the question. In other areas the farm labor shortage is less acute, especially in the noncrop season. Usually drainage projects should be planned so that operations requiring a large expenditure of labor, such as clearing, will be carried on in the noncrop season. There is much work that farmers can do on their own ditches during the slack periods. Much can be done to



Drained land is well adapted to the production of corn and other livestock feeds.

stimulate farmer interest in working on drainage improvements.

Under present conditions it seems improbable that much new equipment will be available for drainage work. This factor, although eliminating many worth-while drainage projects, is not as serious as it may appear. Dragline excavators can be used on most drainage projects. Many contractors will have such equipment available if construction activities of army and naval bases, war factories, flood control projects, roads, etc., should slack off further as appears probable. The possibility that privately owned construction equipment will be available, and that off-season labor can be used to a large degree, are two factors justifying drainage as an important wartime activity.

On those drainage projects meeting requirements for essential wartime activities the engineer should lay aside some of the high standards for peacetime projects and instead design the project for war needs. Fundamentally, the problem is to use a limited amount of labor, equipment and materials, in a manner that will allow maximum production during the next few years. In designing a peacetime drainage project we strive for permanence as well as effectiveness; in wartime we should sacrifice many of the features that make for permanence and even some that would make the project more effective.

The design of each individual drainage project is a problem to be solved by the engineer on the basis of local conditions and requirements; hence, all suggestions given in this article are made with the understanding that the engineer will apply only those that can be classed as "reasonable" according to local conditions.

Victory Ditches

The following principles and methods of reducing expenditures of labor and equipment are suggested for design of drains during the war. (To distinguish such drains from those ordinarily constructed, the term "Victory ditch" is proposed for such wartime jobs.)

The proper capacity, grade, and depth of a ditch should be maintained. Considerable saving can be effected, however, by eliminating smoothing and finishing operations.

In the design of auxiliary structures the engineer should streamline the drainage job for wartime standards. If a bridge must be built, native rough cut logs should be used to the maximum extent. Generally, steel and iron products can be eliminated, except nails, cable, and repair parts. Many headwalls and structures to control ditch bank erosion, considered essential during peacetime, must be eliminated as a wartime measure. As a result, ditches will fill up more rapidly and much repair work will be necessary during the post-war period. By digging out inlets recessed from a ditch, erosion can be partially controlled.

Spoil bank leveling with heavy equipment as a special operation is not considered justifiable as a wartime operation. However, leveling a spoil bank by throwing the dirt farther back with an excavating machine and completing the leveling with farm equipment is justifiable if the additional land will result in increased production of critical crops. The extent of seeding and sodding should be decided according to local experience and availability of labor.

As a result of these measures Victory ditches will be less effective and permanent than the well-designed drainage systems which many engineers, including the writer, have long advocated. In the circumstances, however, we must turn to less permanent and even less satisfactory facilities, not without regret and realization of the danger of losing some of the ground gained in a long struggle to secure better standards. We can entertain the conviction, however, that the use of Victory ditches will result in (1) saving of critical materials and labor, and (2) utilization of a limited supply of labor, equipment, and materials in a manner that will benefit most acreages and allow the greatest increase in production.

Even though Victory ditches will be less satisfactory, in order to qualify as wartime jobs they must be planned so that the benefits will be high in relation to costs. Thus, the costs will be repaid rapidly and additional rehabilitation in the post-war period will be justified.

The importance of maintenance must not be overlooked as a wartime activity. Labor should be available during the noncrop season to cut vegetation out of the channels and to perform necessary repair work. Often the effectiveness of a ditch can be improved from 25 to 50 percent by clearing, and perhaps by shoal clean-out, so that major rehabilitation can be postponed. As previously pointed out, improved farm drainage is equally important with improved outlet drainage. These provisions apply equally to farm and community drainage enterprises.

Where tile drains are feasible they provide excellent soil drainage, and should be encouraged to increase production of critical crops. Generally tile drainage operations are carried on by skilled and experienced workers using special equipment and tools. Clay tile and plain concrete tile are not critical materials. Without doubt the acreage benefited by an efficient tile-laying crew justifies that work as a wartime activity. This is especially true when consideration is given to the peculiar soil and crop conditions requiring tile drainage and the specialized skills of tile-laying crews and workers in tile factories. It must be kept in mind that these men, who help many farmers to increase yields of land by 25 to 100 percent, are performing an essential wartime activity in a manner similar to the farmer who increases production by expanding acreage. An increase in yield per acre is even more valuable than an increase in production secured by expanding acreage, because farm production costs are not increased to the same degree. Production costs per unit are much lower on a well-drained field than on a poorly drained

field, especially where the cost of cultivating wet fields, replanting crops, and depreciation of equipment are fully considered.

Because of the permanent nature of tile drains, it appears that only minor changes in design appear justifiable. Standards should be maintained for good alignment, proper grade and depth, and tile should meet usual specifications. Noncritical materials should be used for manholes, headwalls, and other structures. Often headwalls can be postponed until after the war.

Results of Two Drainage Programs

Effective results can be secured through placing adequate resources on drainage operations, as is evident from a brief survey of two drainage programs, one in the United States, the other in England.

Forty-six CCC camps were placed on drainage operations in 1935. From July of that year to December 31, 1941, a total of 12,000,000 acres were benefited by drainage projects upon which the enrollees worked. These projects included: 6,444 miles of ditches excavated, requiring 64,352,000 cubic yards of earth excavation; a total of 340 miles of tile drains rehabilitated, involving placing of a small amount of new pipe. The work was cooperative in nature—drainage districts and farmers contributed \$4,627,855.16, nearly all in cash, to the projects. It is indeed fortunate that this work was completed so that the results are fully effective during the war period.

It is estimated that corn can be grown on 40 percent of the land benefited, roughly 5,000,000 acres. The improved outlet facilities and the farm drainage work undertaken by the farmer, resulting from the program, probably increased the corn yields 10 bushels per acre. The total probable increase in corn is therefore around 50,000,000 bushels. If 32,000,000 bushels of this is devoted to hog production it will easily result in 400,000,000 pounds of hogs; and the remainder, 18,000,000 bushels, if devoted to beef cattle will result in over 100,000,000 pounds of beef. Hay yields can be increased about 20 percent on some 2,000,000 acres. The hay and pasture program on the acreage benefited can support the beef and hog production stated above.

Another critical crop benefited by this drainage program included soybeans, with an estimated increase of 5,000,000 bushels on 1,000,000 acres at an average rate of 5 bushels per acre. Also, sugarcane production was increased 4 tons per acre on 75,000 acres or 300,000 tons.

The British Government is giving direct assistance on drainage projects. At the end of 1941 direct subsidies had been approved for 1,300,000 acres of farm drainage schemes. Probably most of this program has now been completed. Approved mole drainage schemes covered 150,000 acres, and the tile drainage projects 90,000 acres. It was estimated that 900 draglines including 400 government owned machines would be operating in the United Kingdom by the end of the year. Two drainage engineers from the Soil Conservation Service—Elmer W. Gain, for-

(Continued on p. 214)



ONE OF OUR WARTIME JOBS is to bring speedily into production as many as possible of our so-called "wasted" acres. Some such lands, unsuited to intensive farming, already are contributing food and other products needed in the present emergency. Enough has been done to show how

WAR CROPS FROM WASTED ACRES

BY EDWARD H. GRAHAM¹

worth while it is to develop every hidden asset of every acre.

Some parcels of land are most economically used when specifically managed for wild crops. Other lands, primarily dedicated to tilled crops, pasture, or woodland can, with slight modification, provide useful wild plants and animals.

What are some of the practices which help to support a country at war and assist us to make maximum use of our land resource without waste of time, labor, materials, and funds?

¹ Chief, Biology Division, Soil Conservation Service, Washington, D. C.

Fish From the Farm Pond

Fish from farm ponds have been contributing materially to the Nation's food production program; with the application of known simple management practices they can produce a great deal more. The farm pond provides water for livestock, a refuge for waterfowl, a home for fur-producing muskrats. It is also as productive of protein and vitamin-rich food, acre for acre, as highly developed livestock pasture. We cannot afford to neglect the potential source of many million pounds of palatable food per year. With "red" meat rationed, every pound of pond fish is a pound of meat to the good. This is all the more important now that our supply of marine food fish has been reduced 22 percent through conditions necessitated by the war.

The raising of pond fish is an old and much-used type of farming in many parts of the world but until recently it received little attention in the United States. Modern methods of pond fish production are based upon the maintenance of a rather easily managed food chain. Ordinary fertilizers are added

to the water of the pond to provide nutrient elements. These support microscopic plants that serve as food for minute animals. Water insects feed upon these animals and the microscopic plants. In turn, the insects and small animals—protozoans, rotifers, crustaceans—provide food for forage fish such as the bluegill bream. The forage fish are eaten by carnivorous species, for example, the largemouth bass. Both the bream and bass furnish food for man. The practical marvel of this scheme is that fingerlings stocked last spring will produce bream weighing a quarter-pound and bass weighing a pound apiece next summer. Even a war economy can expect no better production than this.

For the development of this type of fish management, we must take off our hats to the research of H. S. Swingle and E. V. Smith at the Alabama Experiment Station. Their work has shown us productive management methods that can be easily applied. Last year nearly 1,000 farm ponds in soil-conservation districts were carefully stocked with fish obtained from Federal hatcheries as a

Bees increase orchard yields by pollinating fruit tree blooms, and aid in seed production of legumes and other crop plants useful for soil conservation and food production. They provide honey especially valued when other sweets are scarce, and are the only source of beeswax, indispensable for making ammunition grease, pharmaceuticals, and other war materials.



Properly managed farm and ranch ponds provide millions of pounds of food rich in proteins and vitamins—food to supplement rationed “red” meat and replace in part our supply of edible fish which has been reduced 22 percent by war conditions.



result of close cooperation between the Fish and Wildlife Service and the Soil Conservation Service. Several States also gave assistance. These ponds, properly fertilized and managed, will yield per year 200 to 400 pounds of edible fish per surface acre of pond at a cost of from 3 to 6 cents a pound.

How fortunate are Americans to have at their disposal tens of thousands of farm and ranch ponds already constructed and awaiting only slight attention to produce nutritious and tasty food. The London radio tells of housewives standing in line to buy fresh fish for making “fish and chips”; their supply has been severely reduced because English fishing trawlers are needed for mine sweepers. In the United States we eat a great deal of fish. Civilian consumption of fish for food in the United States is shown in the following:

Kind	Yearly average, 1935-39	Estimated 1943
	<i>Pounds</i>	<i>Pounds</i>
Fresh and frozen	934, 000, 000	812, 000, 000
Cured	185, 000, 000	132, 000, 000
Canned (including shellfish)	674, 000, 000	208, 000, 000

Much of this is marine fish. It would, however, be practicable to add enough farm and ranch ponds and reservoirs to furnish us with 100,000,000 pounds or more of fresh fish every year. Even our present production will be greatly valued locally, especially in the South where management is most highly developed and the pond fish are most prized for food.

Wild Fruits

All too frequently it is forgotten that wild shrubs which will grow in special sites not able to support

cultivated crops can provide both food and profit. In the acid bogs of the northern States, cranberries and blueberries offer a source of considerable revenue. Improved varieties of the latter are now available and in 1941 they provided a return of \$750,000; but this is a pittance compared with the return from the wild crop. In a good year, huckleberries and blueberries, picked from wild, unimproved stock, provide in the United States the astonishing return of \$10,000,000. The wild low-bush blueberry of Maine and the lake States alone provides a return of nearly \$5,000,000. Other kinds are highly valued in the East, South, and West. The florists pay to the States of the Pacific Northwest as much as \$200,000 annually for the branches of thick, shiny, dark green leaves of the Pacific Coast evergreen blueberry useful for decorative floral effects. The same blueberry provides an annual food crop valued as high as that of the branches.

As a part of the program to control erosion on agricultural land, biologists have recommended the planting of grasses, legumes, and shrubs on gullies, odd spots, field borders, and other eroding areas. Planted as parts of complete farm lay-outs directed at better use of each acre on the farm, shrubs for these small eroded areas—useless for tilled crops, pasture, or woodland—have been selected not only for their erosion control usefulness, but for the wildlife food and cover they provide, and the human food they produce. The wise farmer's wife will not neglect the patch of wild plums, cherries, currants, high-bush cranberries, elderberries, grapes, and other wild fruits growing now on that "worthless" spot down by the creek, for they are the source of delicious preserves, jellies, jams, pies, and sauces. Unlike cultivated shrubs, these wild ones require no pampering, for they are adapted to soil conditions unsuited to more productive use and, once established, will fend for themselves.

The general picture for the United States regarding cultivated fruits may be seen in these figures showing civilian per capita fruit consumption over two periods, and goals for the present year:

	Yearly average, 1935-39	Yearly average, 1941-42	Goals, 1943
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Fresh citrus.....	49.9	59.7	65.5
Canned citrus.....	2.3	5.1	3.4
Fresh fruit.....	102.2	94.5	77.1
Canned fruit.....	14.2	17.7	3.7
Canned fruit juice.....	3.2	5.3	1.9
Dried fruit.....	6.0	6.7	4.9

Our 1943 supply of many fruits will be reduced because some will go to the armed forces, labor is scarce, and metal and rubber for domestic canning for other than home use are restricted. It thus be-

comes apparent that in the current year we can expect an appreciable contribution to our supply of fresh fruits from those wild kinds most easily grown for use on the individual farm. Furthermore, the labor required to make use of wild fruits available "at home" is far less than that needed to pick, pack, and distribute most cultivated kinds.

Wild plum, a thicket-producing, erosion-control shrub of great value for wildlife cover, is highly prized for human food. Erosion control operations planned for the coming season call for 502,000 plum seedlings of three species, and many farmers also will seed wild plums directly, a practice which lowers the cost of establishing the plants. Wild cherries to the number of 477,000 will be planted. The western sand cherry is a favorite, for it not only holds soil in sandblow areas but produces a large well-flavored fruit. Many other berries, grapes, hazelnuts and filberts, are numbered among the food producing shrubs planted to hold soil and prevent excess runoff on our farms and ranches.

Soil Conservation Service nurseries have produced 150 million shrub seedlings for establishment on a quarter of a million American farms and ranches as part of erosion-control operations. Others have been seeded directly, and many of them will bear useful fruit next fall. Species of value for human food comprise 30 percent of all the seedlings used.

An indirect use of many shrubs planted on wasted areas is the contribution they make to honey production by providing bees with both nectar and pollen. Not all of us realize that honeybees, the only source of honey and beeswax, produce each year in the United States more than 200 million pounds of honey and 4 million pounds of beeswax. In spite of this large production, we import an additional 4 million pounds of beeswax annually. Beeswax not only has many peacetime uses, but is irreplaceable in time of war for making ammunition grease, models, machine patterns, pharmaceuticals, leather dressings, finishes, and polishes.

Honey is all the more sweet when sugar is scarce. Perhaps the most important contribution of bees, however, is their assistance with seed production through pollination of pasture legumes and other plants useful in conserving soil, and the fertilization of fruit tree flowers. Throughout the country many plants used in our food production and better land use program are valuable bee plants. An example is the shrubby bicolor lespedeza which recently has come into extensive use in the South as the woody element in the field border planting established on eroding margins between crop fields and woodlands. This lespedeza is much used by bees—good honey plants are not abundant in the South—and it fur-

nishes a very light-colored, mild honey. Sweet-clover, which grows very well and is extensively used on depleted soils to check erosion, is rated as a top-notch bee plant.

Farm Furs

The environs of the farm pond, the marsh or swamp, stream bank or wood lot, all offer opportunities for the production of farm fur bearers. Since the war, furs used by Americans, usually to the tune of about \$120,000,000 each year, have been reduced fully 50 percent, for imports have practically ceased. Furs are not entirely a luxury item, in spite of their great use for high-priced evening wraps; fur coats and mittens are practical and useful articles of clothing in cold parts of our country. Furthermore, furs are used for many garments, for the making of felt, for brushes, ornaments and other items. The making of fur vests for the Merchant Marine today stresses the value of fur for warm, protective clothing, and our men in Alaska, Greenland, and Iceland find fur clothing warm and comfortable.

Although we have on hand an adequate stock of both imported and domestic furs, this supply is not inexhaustible, and tests being made by the Army indicate greater possible use of furs by our fighting forces in cold regions and high altitudes. The farm is a place where some of these needed furs can accrue as a byproduct of ordinary operations. Muskrat, opossum, skunk, raccoon and mink live well on farm land, and even our most intensively cultivated areas can produce a good crop of fur. For example, Iowa, where farm land makes up 95.3 percent of the State's acreage, produces an annual average of 272,000 muskrat pelts, 105,000 skunk skins, and 75,000 opossum, mink, and raccoon hides. This take is valued at \$625,000 per year, and three-fourths of it is produced on less than 4 percent of Iowa's agricultural acreage.

To the farm family there is profit in the managed fur harvest. Although the farmer is busy with the production of staple foods, the farm boy will find time to run a trap line, and many farmers' sons who have made the bulk of their college money that way will attest its benefit. If the experience of the last war is any criterion, the value of farm furs will rise this year and next. During World War I muskrat pelts rose 72 percent in value, and they are likely to bring \$1.50 or more before this war is over. Opossum hides rose 150 percent in value during the previous war, striped skunks increased 153 percent, raccoons 190 percent, and mink 9 percent. Some, such as the mink, may not repeat their previous rise, for they are already bringing an average price of more than \$5, a figure higher than they brought during the first World War.

Fur bearers can contribute more than their pelts to the war effort, if they are used without waste. Hunters are being urged now to save the bodies of all small mammals killed, so that they may be rendered for glycerine to be used in making explosives. Moreover, fur bearers can provide food. The opossum has long been a favorite food, and in Louisiana muskrat carcasses are being frozen in local storage plants, dressed as "marsh hares" for table use in eastern markets. The flesh is dark colored and well flavored, and the only special treatment required to make the animals entirely fit for food is the removal of the two musk glands. In Louisiana alone, 6,000,000 muskrats are caught annually, providing a potential meat supply equivalent to 6,000 beeves.

Crops and Insects

To protect the crops grown the land management biologist assists land operators to develop management practices that tend to reduce numbers of injurious insects. The losses from harmful insects occasioned each year to crops grown in the United States are about 3 billion dollars. The cotton-boll weevil causes a loss of more than 120 million dollars, the corn earworm nearly 100 million.

The control of insects, like the control of any plant or animal pest, is not entirely accomplished by direct attack, as by spraying or burning. In fact, these methods sometimes may be biologically undesirable and economically impractical. Tillage practices and other cultural methods developed jointly by the land manager and the biologist are often the best kind of insect control. In the Northern Great Plains, subsurface tillage by special implements leaves grain stubble or mulch on the surface of the soil to control wind erosion. At the same time it reduces the number of grasshoppers, for these insects lay their eggs in open, well-packed earth not accessible to them under such a mulch. Early planting of corn, plus fall plowing where erosion is not increased by such practice, combine to reduce greatly the damage by the European corn borer.

Burning, once thought to be a desirable insect control measure, is now acknowledged to do more harm than good. Protection from fire and grazing, furthermore, is one of the most effective means of assuring a crop of wild fruits from the hedge row or berry patch. Regular burning of fence rows, hedges and field borders tends to perpetuate annual weedy plants which in a few years' time would be replaced naturally by more desirable perennials if fire were prohibited. The insects inhabiting perennial vegetation nearly always are less injurious to crops, and in such habitats live many insects that

are predacious upon harmful species. We now know that permanent fence rows are about the only places on the farm where beneficial insects, as lady beetles, assassin bugs, and damsel bugs, can live undisturbed from year to year. Shrews also live in such woody cover, their diet consisting almost entirely of insects.

Thus proper attention to the parts of the farm or ranch pattern consisting of wild perennial vegetation—stream banks, hedges, field borders, revegetated gullies and so on—can reduce the populations of harmful insects as surely as the use of tillage, crop rotations, or other cultural practices. The war against insects we have always with us, and it is imperative that we pay particular attention to the way in which soil and moisture conservation practices, as well as all other land management measures, affect the numbers of injurious insects, so detrimental to the plants that provide us with food, fibre, oils, and other agricultural products essential to our welfare in times of peace or war.

Selective Service for Every Acre

In time of war it is more than ever necessary to prevent waste. This is true of time, steel, oil, rubber, manpower, food, fiber, transportation and, no less than all the rest, the land. The land is used wisely when it is made most productive without loss of the fundamental resource—the soil. Waste of land can be prevented by using seed, fertilizer, horsepower, and time, only on those areas that we know will produce high yields. It is inexcusable waste to seed, cultivate and fertilize badly eroded galled spots, highly alkaline areas, or depleted field borders that are inherently unproductive, and to plow into the creek bank where the field will tumble into the stream with the next freshet. It is also unwise to expect most profitable returns from cattle pastured on rocky outcrops, escarpments, sand dunes, in wet marshes or woodland. To try these things is to build a house upon quicksand—and as unreasonable and profitless. Yet there are for these areas profitable uses requiring little time, effort and cost, uses that will render them productive with as great return upon investment as can be realized on any acre of the farm.

These small areas, scattered over our farms and ranches—a quarter acre here, two acres there, or an occasional vast stretch of marsh, together with the borders of streams and ditch banks—add up to the surprising total of more than 33,000,000 acres of land throughout the United States, an area nearly equal to that of all New England. These lands erode, often more than others do, but they can be



Farm areas useless for tilled crops, pasture or woodland provide a profit in furbearers easily harvested by the farm boy. Furbearers also yield fats for making explosives, furnish food, and contribute a share toward replacing the many million dollars worth of furs which can no longer be imported because enemies have blocked the usual sources of supply.

made to produce crops—crops of useful wild plant and animal life—the crops which comprise the “Selective Service” for these lands.

It is with this objective in mind that the biologist makes one of his real contributions to the management of agricultural lands. To maintain yields of crop lands he lends his special skill to assist in developing land management methods rendering crops least susceptible to injury by insects. He aids in preventing attempts to produce high yielding crops on unproductive sites, determines for such areas adapted crops of useful wild plants and animals, and develops management recommendations for producing them. Thus the marsh too wet for pasture yields muskrats and other fur bearers, the eroding area gives forth fruits for human as well as wildlife use, the pond supports an abundance of food fish.

Just as it takes more than one skill to make a plane or plan a campaign, so it takes more than one technique to manage land. The farmer, economist, agronomist, engineer, forester, range manager, biologist—all are needed to coax from the yielding land the food and fiber needed to fight this War and win the Peace. Together they can classify each parcel of the land for the use to which it is most neatly adapted, and accordingly manage it for the highest production at the lowest cost, in labor, money, and materials. And all of this not alone for today's extreme effort, but that the land be preserved as productive next year, next decade, next century, as it is today, so that we may prosper and our Nation endure.

Negro farmers have an important part in producing food and carrying on other war work. While the number of Negro farmers decreased by 16 percent from 1935 to 1940, the total acreage farmed by them increased by 18 percent during the same period.

There are now over 700,000 Negro farmers. Many members of these farm families are working in munition and other war plants near their farms. The crops they produce for sale and the food they produce for these war workers go a long way in helping our country to attain war goals.

As a part of their efforts to reach the war goals, Negro farmers are using conservation practices to help increase their farm production.—A. T. Semple.

NEGRO FARMERS PUT CONSERVATION ON PERMANENT BASIS



Jim Peyton, his niece, and his mother threshing crimson clover seed by hand to get seed for planting as a part of Jim's conservation plan.

BY T. L. ASBURY¹

S. H. LEE, NEGRO COUNTY AGENT at Macon, Ga., has preached cover crops, rotations, pasture improvement, and other good farming practices to Negro farmers in Bibb County for 13 years.

Like other missionaries who have done good work, Lee found he had a lot of backsliders, but he saw his opportunity, when the Middle Western Ocmulgee River Soil Conservation District began operations in his county and several others in middle Georgia early in 1942. He knew that this was his chance to get good farming practices established on a more permanent basis because conservation plans

were definite in nature and would be carried out over a period of years. Without delay he explained the district program to his group of Negro farmers and encouraged them to submit applications for district assistance. Then, working in close cooperation with George Seville, work unit leader of the Soil Conservation Service, he began developing conservation plans for the farms shortly after work in the district got under way.

The development of complete conservation plans—with individual farm maps showing the capabilities of the soil and the proposed land use program, along with a definite work schedule for setting up conservation practices year by year—is giving these farmers a new enthusiasm for their work and a new sense of the importance of their job.

¹ State conservationist, Soil Conservation Service, Athens, Ga.



County Agent Lee and Leonard Hart, examining growth of sericea in a field that provided three cuttings of hay in 1942 after being grazed until the last of March.

Even with definite conservation plans to serve as guides for their farming operations, some of Lee's followers occasionally slip back into careless habits: Wesley Hart, for example, left his crimson clover seed in a crib in the barn, without taking into consideration how far a mule's neck would stretch or the extra distance he could reach with his tongue.

When Wesley confessed to Lee and Seville during a visit to his farm that his mule had "got into" his crimson clover seed, Lee threw up his arms in a gesture of despair. "You mean your mule ate up your crimson clover seed!"

"Just about half of it, Mr. Lee," Wesley responded quickly, in an attempt to minimize the damage.

The look on County Agent Lee's face showed that the loss of this seed was no minor tragedy. Like the legendary horseshoe nail, it involved a series of complications, for in the carefully worked out plan for Wesley's farm, corn was to follow the crimson clover, and oats and lespedeza were to follow the corn, and cotton was to follow 2-year lespedeza in a systematic rotation. Now it looked as though the chain of events was about to be broken at the first link.

"If I don't have enough seed to plant that clover like I'm supposed to," Wesley announced, sensing the seriousness of the situation, "I'll buy me some more, so I can carry out my plan."

Away from the scene of the clover incident at the barn and down in the field where the rotation actually was being established, the outlook was much brighter. In two terrace intervals of the field, Wesley had an excellent growth of Korean lespedeza, which he said would be left there another year, in accordance with his plan. The clover, he explained with some hesitation, would be planted on the land he had in cotton, and would be followed by corn in the spring.

In addition to the annual lespedeza, he had good stands of sericea and kudzu, which were planned for the dual purpose of controlling erosion and providing a permanent source of feed. With 12 cows and an Angus bull, Wesley explained, he intends eventually to build up a beef herd on the farm, as he develops his pasture, hay, and other feed.

In a 1-acre garden patch, Wesley's wife, daughter, and grandchild were picking butterbeans, which he had planted at County Agent Lee's suggestion. He already had sold \$50 worth of beans from the patch, Wesley said proudly—for this represented an entirely new source of income for the farm.

All in all, it looked as though things were going pretty well on Wesley's farm, when the lespedeza, kudzu, sericea, and butterbeans were balanced against the loss of the clover seed. But as he started to leave, Lee felt that one parting shot was needed to make sure no mule ever again would enjoy a meal of clover seed on Wesley's farm.

"You see Jimmy Peyton and get you some seed," Lee admonished as he drove off toward the next farm. "Jimmy's got plenty of seed, and he didn't leave it lying around where his mule could get it."

"I sho will, Mr. Lee," Wesley said seriously. "If I live and nothing happens, I sho will."

And it is a safe bet that Wesley will.

Leonard Hart, on the next farm, was in the garden picking okra to take to the market in town the following day. At \$3 a bushel, he said, he had sold over \$100 worth from an acre and a half plot, and he had sold lots of turnip greens, squash, collards, and other vegetables besides. Following Lee's suggestion he had planted squash this year in July for a late crop and with excellent results.

Leaving other members of his family to finish picking the okra, Leonard cut across a field to show his visitors his sericea, while he discussed other phases of his farm plan and the progress of his crops. The sericea had been planted 3 years before, also at Lee's suggestion; and in 1942 the district had furnished him 500 plants for an acre of kudzu which eventually would be expanded to 7 acres and would provide from his poorer land a permanent source of feed for his 7 cows.

Before he planted his sericea, Leonard said, he didn't have much of any hay, except peavine and Johnson grass "around about" in his fields. He grazed the sericea in 1942 until the last of March and then got three cuttings of hay during the summer. What this farmer liked best about sericea was the way it stood dry weather.

"The root is farther in the ground than the plant is tall," he explained, as he tugged at a foot-high stem that had grown since the last hay was cut. Finally

the stalk broke at the ground, but the root remained, proving his point about its depth.

"I'm going to put some acid on my sericea in the spring like it says in my plan," Leonard commented.

"If you read your plan again," Lee corrected, "you'll see it says three sacks of acid, not just *some*."

"That's right," Leonard agreed. "Three sacks, that's what it says."

At Amos Jones' farm, Amos told us how he got started with kudzu before his plan was made. Tax Collector Dunwoody had come by one day and they talked about a washed-away hillside that can be seen from the road. Dunwoody advised Amos not to try "to tend that land any more" and told him where he could get some kudzu vines to plant there. Amos followed his advice; he planted vines with two or three joints during a good season, "just like you would sweetpotatoes," and with good results.

"I find if you plow it up like you don't care nothing about it, it will grow better," he said.

Before he planted the kudzu, Amos had offered to give the hillside to his wife, suggesting that she get a bushel of oats and sow it there. Even if she didn't harvest any oats, he told her, she would get \$10 worth of grasshoppers on the oats for her chickens to eat!

Now that Amos has a complete conservation plan for his farm, a lot more eroded land that he has been trying to "tend" is going into kudzu. Systematic rotations are being set up on the better land and with terraces and meadow outlets will help to keep the remaining areas of good land productive. The kudzu and other hay will provide feed for his cows, as well as protection against further damage to the land by erosion.

Jim Peyton and County Agent Lee display a 35-foot runner produced by a kudzu plant during the first growing season on severely eroded land.



Pleasant L. Wesley, whose wife is a home demonstration agent, has made considerable progress in establishing his conservation program. When we saw his farm he had a large area planted to Korean lespedeza which had been sown on oats in the spring and was to remain on the land 2 years. The field was terraced, and a broad meadow outlet of sericea lespedeza extended down through a natural draw to a creek in the bottom. The bottomland was being cleared of brush and developed for permanent pasture. Up near the house on some of his most fertile land, he had planted 2 acres of kudzu that was making vigorous growth.

"The thing I like about kudzu," County Agent Lee commented, "is that once you get it established it's there to stay. I had some fine demonstrations of Austrian winter peas around through the county several years ago, but those farmers haven't planted any peas since. When you get kudzu or sericea on the ground, they stay there."

Probably the best example of the work that County Agent Lee and Conservationist Seville are doing with this group is on Jim Peyton's farm a few miles out from Macon. When Jim moved to the farm 30 years ago at the age of 18, the land was covered with virgin timber. Jim helped his father build the house where he lives today, and over a period of 14 years they cleared the trees from 53 acres of surrounding land.

Some of the trees were 3 feet in diameter, Jim told us. It wasn't easy work felling those big trees, sawing them into short lengths and splitting them into stovewood, but they managed to cut 100 to 150 cords a year to sell in town, which helped them to make the payments on the farm. They might have got a lot more for the wood as sawlogs, but they did not know much about timber values.

They did not know either how quickly those steep slopes would be destroyed by erosion when the protective cover of trees was removed and the slopes were planted to cotton and corn year after year. Land that was virgin soil when they moved to the farm made good crops for 8 to 10 years, Jim recalls, but after that the yields were "mighty poor." Today much of the land is riddled with gullies that have cut deep into the subsoil.

Because he did not know anything about proper land use or conservation measures, Jim accepted this condition as inevitable. As the area of productive land diminished and his cotton yields decreased, he sought new sources of income. During the summer he peddled vegetables and in winter he sold stove-wood to regular customers in town. For a number of years he has been cutting an average of 6 tons of hay a year from the campus of Wesleyan College in Macon to help carry his cows and workstock through the winter. On his regular trips to town twice a week to peddle vegetables and wood, he collects scraps to feed his hogs.

Jim has managed to provide a good living not only for himself and his mother, but for an aged uncle, and for two nephews and a niece who came to live with them when their mother died. Jim sent the two boys through high school and they are now sergeants in the army. His mother, his young niece, and Jim constitute the only labor on the farm, but last year he made a final payment of \$200 on a \$600 mortgage that was left on the farm at his father's death.

When Lee and Seville helped Jim work out a conservation plan for his farm, the conservation survey

showed that of the 53 acres of cleared land, only 21 acres on the tops of ridges was suitable for cultivation. A 4-year rotation was planned, consisting of 5 acres of oats, followed by lespedeza for 2 years, 5 acres of cotton, followed by crimson clover, 5 acres of corn, with one acre set aside for garden and truck crops.

The remaining 32 acres of steep, severely eroded land is all being planted to kudzu, which eventually will provide sufficient hay and grazing to enable Jim considerably to increase his livestock. Good woodland management practices will be followed in the 50 acres remaining in woodland, allowing cordwood for sale each year and development of the stand for timber production.

As a result of the work done by County Agent Lee before the district operations began, Jim already had started planting crimson clover and vetch for winter cover and soil improvement. He saved enough crimson clover seed last spring to plant 5 acres of clover this fall, to be followed by corn next spring. He also sowed 5 acres to oats, on which lespedeza will be planted in the late winter or early spring, when his rotation will begin to take definite shape.

The district program, as County Agent Lee sees it, is providing an opportunity for getting good farming practices established on a permanent basis. It still takes some prodding here and there to get the conservation job done; but with good farming practices brought together in a unified program for each farm, he finds it a lot easier than it was before the district was organized in his county.

NEW DISTRICT WORKS TOWARD WARTIME GOALS

BY ROBERT E. BURGESS ¹

ON DECEMBER 8, 1941, the supervisors of the Claunch-Pinto Soil Conservation District, in central New Mexico, held their first meeting. On that day, the new soil conservation district, like the rest of the Nation, joined the fight. Since that day the supervisors and the people of this district have carried through with such vigor and with such deep faith in the wartime necessity of soil conservation that their district is now known as one of the most progressive of 33 such organizations in New Mexico.

The district was organized in the summer of 1941 after farmers in the Claunch-Pinto area had seen the results of terracing and contour farming in a nearby bean-farming area where dry farm conserva-

tion practices had increased bean yields an average of 82 pounds per acre.

This belief in conservation has taken concrete form. The five supervisors advanced \$100 apiece, out of personal funds, to buy a tractor needed for construction of stock tanks, terraces, and other conservation structures in the district. In addition, these same supervisors took it upon themselves to pledge personal credit, in the amount of \$200, for the purchase of additional equipment which is being rented at a nominal fee to farmers and ranchers building stock tanks.

To "get in the scrap," they took steps to furnish labor and transportation to any farmer who wanted to donate his scrap to the district. The scrap from the farms is hauled to junk dealers and sold. The money goes to the district treasury for needed

¹ Work unit leader, Southwest Region, Soil Conservation Service, Mountainair, N. Mex.



Contour cultivation and terraces hold moisture and curb wind erosion in the Claunch-Pinto soil conservation district. Through the use of such practices, some farmers have doubled their bean yields. This view was obtained on the R. E. Rayburn farm, near Eastwood, N. Mex.

equipment and expenses. The scrap goes to fight the war on many fronts.

Pooling of transportation is nothing new here. As soon as it became known that gasoline and rubber were critical materials, the supervisors began using one car to attend their monthly meetings. Living, as they do, in widely separated locations in the more than 500,000-acre district, they have worked out a plan whereby each supervisor is picked up in turn by the one who lives farthest from the headquarters.

Although the growing of pinto beans is the chief farming activity in this rolling country, some of the operators also run sheep and cattle on the piñon-juniper range lands adjoining their bean fields.

One of the priority jobs in the District Work Plan is the development of adequate stock water on range lands. Water has been a problem because wells must be 400 to 1,000 feet deep, and in many locations water is unobtainable even at these depths. Many farmers have hauled the precious liquid as far as 20 miles for domestic stock. Some ranchers have hauled water to isolated parts of their domains. The unfortunate consequences have been threefold—overuse of some locations; no use at all of other



Noel M. Hibler, secretary-treasurer of the district, standing beside one of the windmills which are symbolic of the importance of water in a semiarid country. Wells are deep—from 300 to 1,000 feet. Annual rainfall is but 15 inches. The district has built many stock water tanks for cooperators.



Crested wheatgrass, a year old, on the E. M. Stewart ranch near Claunch, N. Mex. The wheat grass was planted in rows and cultivated. In the fall of 1942 the field was combined for seed and, as the picture indicates, the wasted seed will make the field virtually a solid grass sod in another year.

areas; and the development of a one-crop farming system without advantage of livestock and facilities for marketing feed crops.

Formerly the practice of hauling water was very expensive and troublesome; now, with the shortage of rubber and gasoline, it is prohibitive. The supervisors are of the opinion that the district can contribute a great deal to the war effort by building stock dams in water drainageways to bring about better distribution of livestock and to make it possible to graze lands that could not be used before. This practice already has resulted in better protection for the land and increased production of beef and mutton for the fighting forces. Also, bean farmers faced with a labor shortage can turn those acres that otherwise would have lain idle to the production of forage crops.

Another significant activity of the district, pointed just now toward wartime production, is the reseeding program. Ben Roberts, vice chairman of the district, is somewhat of a pioneer in this work. Five years ago, he planted crested wheatgrass on one of his pastures. Roberts says that after 5 years of hard use by sheep and cattle, he still has an excellent stand of grass which the stock seem to prefer to grama grass.

After the district had been organized, and encouraged by Roberts' successful experience with reseeding, district farmers started out to reseed other abandoned farm lands that were out of production and were being seriously damaged by wind and

water erosion. This work really got well under way last summer, and some 250 acres of crested wheat and other adapted grasses are now showing good stands and are on their way toward adding to livestock production in the district. For the first 2 years most of this acreage will be reserved for seed which will be used to enlarge the reseeded areas.

As J. W. Garrison, chairman of the board of supervisors, remarked, "There is a great need for this particular part of the program. A lot of land has been abandoned here in the district because of topsoil loss. We feel that if we can bring this land back into production of grass we'll eliminate a bad erosion problem and at the same time increase livestock production."

To get back to beans, the district is looking to terracing, contour cultivation, and strip cropping to do great things for this important crop. The area gets an average of about 15 inches of moisture each year, which means that every drop has to be conserved if beans are to be grown successfully. Then, too, with the knowledge that yields can be increased through conservation methods, the Claunch-Pinto farmers are looking forward to better incomes as a result of terracing and other practices. Right now, with bean prices up around \$4.50 per hundred, a few more pounds per acre means real money. This season some farms yielded as high as 1,200 pounds per acre, with an average somewhere around 600 pounds.

The blending together of various agricultural programs through the medium of a soil conservation

district has proved profitable and helpful to Claunch-Pinto farmers. For example, in building terraces and other conservation structures, they are working closely with AAA and many are receiving conservation payments which help pay for the needed conservation work. Likewise, the Forest Service, which administers some of the range lands within the district, is cooperating with the district in its conservation work and is thus helping to prove the value of the soil conservation district mechanism.

The supervisors of this progressive district are J. W. Garrison, Benjamin H. Roberts, Noel M. Hibber, Sam Brown, and W. F. Jones. Not long ago they prepared a statement for the information of farmers

and ranchers in the district. The quotation below is from this statement:

"We, as landowners, will be better able to accomplish greater conservation through an organization than through individual efforts. The value of the district to any interested person is simply this: It gives you an opportunity to study your land and your farm or ranch business in the light of all the recent improvements in agriculture."

Claunch-Pinto farmers and ranchers believe in their organization and in what they can accomplish with the district. Their program is launched and they are on their way toward their goals and the goals of the Nation at a time when better agriculture in the United States is needed more than ever before.

CROTALARIA PAYS OFF

BY T. S. BUIE¹

FARMERS IN THE SOUTH are accustomed to thinking in terms of chemical fertilizers when they think of increasing crop yields. Should someone announce the discovery of a new fertilizer in which the vital ingredient, applied only once at the rate of 5 to 30 pounds an acre, would greatly reduce soil erosion, and at the same time increase the productivity of poor sandy land threefold or fourfold, farmers would want to know where this new wonder product could be bought. They would not care about the price per pound.

No such chemical compound is available, as we all know, but many southern farmers can get the same results by planting 10 to 15 pounds of scarified crotalaria seed per acre with corn, or by sowing 30 pounds of unscarified crotalaria seed on oats in late February or early March. The crotalaria will produce a seed crop; and the mature seeds if allowed to shatter out on the ground will give satisfactory volunteer stands following the last cultivation of the succeeding row crop, or after small grain is harvested the next spring. The volunteer crotalaria furnishes excellent ground cover during the late summer and fall, produces additional seed, and provides plant residue for considerable protection against erosion the following winter.

Successive volunteer crops of crotalaria gradually increase the productivity of the land without requiring any major changes in the cropping system or fertilizing practices. Nor is it necessary to make any changes in the land preparation or cultivation of the crops with which crotalaria is grown, except in the case of corn. With corn it is a good practice



Crotalaria lifted the average yield of corn from 10 bushels per acre to more than 25 bushels per acre, on this field in the farm of Tebe Shepherd, near Rockingham, N. C. Here is the owner (right) with W. B. Little, work unit conservationist of the Brown Creek soil conservation district, taking a look at a heavy growth of volunteer crotalaria which is being plowed under for soil improvement.

to cease cultivation when the crop is about waist high as this gives the crotalaria a chance to make a good growing start and does not appear to reduce the yield of corn.

Farmers in the Coastal Plain section of several Southeastern States planted crotalaria in field trials in cooperation with the Soil Conservation Service in 1938. The plan of these simple trials included one plot in which crotalaria was planted in corn

¹Regional conservator, Southeastern Region, Soil Conservation Service, Spartanburg, S. C.

rows between the hills of corn, a second in which alternate rows were planted to crotalaria, and a third plot in which every third row was planted to crotalaria. The crotalaria was planted on the same date as the corn so that it might produce a full crop of seed.

Cultivating the corn thinned the crotalaria considerably in the first plot as many small plants were covered by soil, but a sufficient number of plants survived to produce a fair seed crop. The other plots produced large yields of seed. The seed on all plots was allowed to shatter out and remain on the land. In 1939 volunteer stands were not as thick on the first plot as on the other two, but after the second year thick volunteer stands were established on all plots.

J. I. Lightfoot, of Troy, Ala., a cooperator of the Wiregrass Soil Conservation District, planted one of these field trials on a poor, sandy field. The volunteer crotalaria that grew in 1939 was turned under and followed by corn in the spring of 1940. The yield of corn was 21 bushels per acre, or approximately three times as great as the yield this sandy field was producing before the crotalaria was planted. Another volunteer crotalaria crop that grew after the last cultivation of corn in 1940 was turned under and followed by cotton in 1941. The cotton plants made vigorous growth and although the yield was low because of severe boll weevil damage, it was apparent that the cotton yield would have been satisfactory if the boll weevil had not interfered.

This field on the Lightfoot farm was planted to corn again in 1942 and a yield of 30 bushels per acre was obtained. Similar land nearby, where no crotalaria had been grown, produced approximately 10 bushels of corn per acre in 1942. The average corn yield for the sandy soils in this section seldom exceeds 10 bushels an acre.

Other farmers in the various States where these field trials were conducted, obtained results similar to those on Mr. Lightfoot's farm. Their crop yields have gradually increased from year to year on land where they planted crotalaria once and then went ahead with their normal cropping practices. They have been able to reduce the amount of nitrogen applied to crops following crotalaria and have not increased other fertilizers, although increased amounts of phosphate and potash might have been profitable.

These better yields of corn following crotalaria, such as were obtained by Mr. Lightfoot and other farmers in the field trials, may appear low to farmers accustomed to yields of 40, 60, or even 80 bushels of corn per acre. It must be remembered, however, that these yields resulting from the use of crotalaria are approximately double the average corn yield in

most of the Southeast. In fact, the average yield of corn in some Southeastern States is far below the cost of production.

The Florida agricultural experiment stations pioneered in research with crotalaria. The crop was introduced in that State several years ago, and in the experimental work that followed the new crop was found quite valuable as a soil builder. At the Citrus Experiment Station at Lake Alfred, crotalaria and several other cover crops were grown in a young orange grove that was planted in 1925. The increase in the cross section area of the trunks of the orange trees during the first 7 years, 1925 to 1931, under the different cover crop treatments was as follows: *Crotalaria striata*, 18.9 square inches; Natal grass, 17.8 square inches; beggarweed, 16.9 square inches; velvet beans, 15.6 square inches; clean culture, 13.3 square inches.

The total yield of fruit resulting from the different cover crop treatments during the 4-year period, 1928 to 1931, was as follows: *Crotalaria striata*, 169.5 boxes; Natal grass, 157.2 boxes; beggarweed, 135.4 boxes; velvet beans, 114.7 boxes; clean culture, 40 boxes.

Likewise, crotalaria ranked above a number of other cover crops in a 2-year rotation with corn and sweetpotatoes at the Florida Agricultural Experiment Station at Gainesville. The average annual acre yields of sweetpotatoes, over a period of 4 years, following different cover crops were as follows: Florida pusley, 20.8 bushels; beggarweed, 23.4 bushels; velvet beans, 26.9 bushels; cowpeas, 27.9 bushels; and *Crotalaria striata*, 38.9 bushels. The 3-year average acre yields of corn following these cover crops were: Florida pusley, 8.7 bushels; beggarweed, 12 bushels; velvet beans, 16.8 bushels; cowpeas, 14.2 bushels; *Crotalaria striata*, 16.6 bushels.

Since this experimental work, crotalaria has become the most important soil-conserving legume grown in several north-Florida counties, especially in Madison and Suwannee.

As a direct result of a few field trials in the former erosion-control demonstration project at Gainesville, Ga., in which crotalaria was seeded on small grain in the spring of 1938, several hundred acres of grain land was seeded to crotalaria in the spring of 1941. Since then this practice has spread rapidly in the Upper Chattahoochee Soil Conservation District around Gainesville. Many farmers in the district have no equipment for harvesting lespe-deza and other kinds of seed, but usually they harvest by hand sufficient crotalaria seed to plant whatever acreage they need on their farms. This makes it a particularly valuable crop for small farms without



J. I. Lightfoot, Troy, Ala. (right), tells M. B. Smith, work unit conservationist of the Wiregrass soil conservation district, that crotalaria over a short period of years jumped his corn yield from 8 bushels per acre to from 25 to 30 bushels. He first planted crotalaria in 1938 and each year since the crotalaria has come along with a good volunteer stand.

such equipment.

In the Richmond County work unit of the Brown Creek Soil Conservation District in North Carolina, the acreage of crotalaria has been expanded from 160 acres in 1936 to approximately 30,000 acres in 1941. W. B. Little, work unit leader of the Soil Conservation Service, assigned to Richmond County, reports as follows on a poor sand hill farm rented by Tebe Shepherd from Dr. F. B. Garrett in the fall of 1935.

Shepherd helped the former tenant harvest corn from 6 acres of sandy land the first autumn, and he said that they put all the nubbins from the 6 acres in two cotton sacks which then were not quite full. This field was planted to wheat in the fall of 1935 and fertilized with 75 pounds of nitrate of soda per acre in the spring of 1936. The yield of wheat was $1\frac{1}{2}$ bushels per acre—4 bushels less than the amount of seed wheat planted on the 6 acres. At Little's suggestion, Shepherd planted *Crotalaria striata* on this field in 1937 and turned it under for corn in 1938. Corn, with 100 pounds of mixed fertilizer per acre, made 27.4 bushels per acre. Volunteer crotalaria that grew following the last cultivation of corn was turned under in the spring of 1939. The corn that was planted was not fertilized, yet it made 16 bushels per acre.

In 1940, 1941, and 1942, this same field was planted to wheat and fertilized with 75 pounds of nitrate of soda per acre each year. Good stands of crotalaria were obtained after wheat was harvested. Acre yields of wheat were: 1940, 11 bushels; 1941, 17.5 bushels; 1942, 21 bushels. These remarkable increases in yields were obtained with unusually light

applications of fertilizers. It is almost certain that even better results would have been obtained on this poor sandy land if moderate amounts of phosphate and potash had been applied.

Across the line in South Carolina, crotalaria is proving to be a most dependable and effective soil-conserving crop for the sand hills section. David L. White, of McBee, S. C., is growing crotalaria extensively as a soil-improving cover crop in peach orchards and on cropland. He says his peach trees live longer, produce better yields, and remain in better condition where crotalaria is used as a cover crop than on similar soils without it.

The use of this legume as a soil-conserving crop has been restricted to some extent because of the possibility of livestock poisoning where volunteer crotalaria plants are harvested with such annual hay crops as soybeans and cowpeas. *Crotalaria spectabilis* is known to be toxic when eaten in considerable quantity. There have been instances where the death of livestock was attributed to grazing green crotalaria on cropland in which cattle were pastured after corn was harvested in the fall.

On the other hand, it was a common sight during the fall of 1942 in Florida, Georgia, and Alabama, to see cattle grazing in pastures where *Crotalaria spectabilis* was in full bloom. No harmful effects were reported. In fact, several farmers in Madison and Suwannee Counties, Fla., say they are getting more and better pasture grass where it is growing with crotalaria.

Numerous examples of farmers finding crotalaria a valuable soil-building crop could be cited, but its use has not spread as rapidly as its performance would justify. The next few years, however, should see a great expansion in crotalaria acreage. For one thing, the soil conservation districts, especially those located in the Coastal Plain section of the Southeast, are emphasizing the value of crotalaria. This past fall a number of districts urged farmers to make a special attempt to harvest enough seed to increase their acreage. Then, too, the effect of war in curtailing nitrogen supplies for commercial fertilizer will make it almost imperative for farmers to turn to crotalaria and other soil-building legumes if they wish to maintain or improve their yields of corn, wheat, and other crops.

Crotalaria is well adapted to agricultural conditions in the Southeast. There is a vast acreage of poor land that could be improved with the use of crotalaria, and moreover the percentage of land planted to row crops with which crotalaria could be grown to an advantage is very high. When a good crop of seed is produced and allowed to remain on the land, crotalaria comes in as a volunteer cover.



BOOK REVIEWS AND ABSTRACTS

by Phoebe O'Neill Faris

FOOD: A WEAPON FOR VICTORY.

By Bertram Fowler. Boston, 1942.

There is one thing that can be said of the American people: When we see with clarity that we have been dolts and dotards, living in a fool's paradise, then we move all heaven and earth to make up for it. Sometimes we plunge into another dilemma-with-horns, occasionally through exuberance but more often because we do not see our objective from all sides at the right time. The time has come now, if it is ever coming, when we had better go into a huddle, one-hundred-and-thirty-million strong, and think with all our national brain power about this food-as-a-weapon business. Bertram Fowler's book, the first to deal with the problem of food relief for Europe after the war is won, is extraordinary for concreteness and the courage of conviction. Two readings are recommended by the reviewer, with an interval of at least two weeks between to give the thinking machinery a chance to get into position for broader concepts.

Mr. Fowler, one of the editors of *Free America*, apparently has thought deeply on his subject and has done a tremendous amount of research to determine whether or not his scheme can be carried out. His book propounds a definite plan for formation of a United Nations post-war famine relief organization, to be headed by a Coordinating Committee composed of members appointed by each and every one of the Allied Nations. It is the *United Nations* motif that gives the plan its power as a weapon for peace.

The United Nations famine relief organization would be empowered to purchase immense stocks of food and medical supplies, and seeds and farm machinery, from all producing countries, and arrange for their distribution in famine areas immediately upon deliverance by Allied armies. The stake that agriculture will have in any such relief program needs no emphasis. The strain on the agricultural lands of the United States will be tremendous even though feeding hungry Europe immediately after the war should turn out to be a United Nations job. Mr. Fowler's idea is that agricultural experts should be summoned at the very beginning to provide information concerning every producing nation of the world and to plan crop shifts and conservation methods for raising vitamin-rich and protein-rich foods with the least possible damage to the soils.

The author's discussion of the probable impact upon agriculture of a United Nations famine relief program deserves considerable attention. He is of the opinion that it would bring balance of agricultural markets, of land use and production; it would bring expansion of newer and better curing and processing methods, with dehydrating units

moving about the country to preserve foodstuffs often wasted for one reason or another.

The plan set forth in this book already is receiving a great deal of attention, and although it may not be perfect in detail it nevertheless is something definite and certainly it stimulates post-war planning toward goals we all want to attain. It is thought by many, the author of his book in particular, that if we begin now to accumulate an international arsenal of food stores so that there need be no delay in feeding the hungry people of Greece, Poland, Yugoslavia, Belgium—all helpless small countries that now suffer under the Nazi heel—if we do this now, and let them know we are doing it, it may shorten the war and have tremendously important effects upon after-war discussions.

There is no doubt that Mr. Fowler's famine relief plan would involve some seemingly impossible accomplishments—as, for example, the problem of transportation and shipping. But in view of the fact that his suggested program is built upon the theory of internationalism it is a good program and it ought to work for much good, if it works at all, not only for suffering Europe but also for the cause of the United Nations and for world enlightenment. It ought to, but will it? Do we know the people of Europe well enough to go to such lengths to relieve their suffering? In their bitterness and misery, how will they react to “policemen bearing gifts?” These are some of the questions we must ask ourselves during the second reading of Bertram Fowler's book.

FARM DRAINAGE

(Continued from p. 199)

merly at Fowler, Indiana, and Henry M. Luebcke from Lagro, Indiana—have been in England since August, assisting with this work. Reports from these engineers indicate that the program is progressing well and benefits are materializing.

A quotation from the message of British Minister of Agriculture, delivered in the House of Commons March 18, 1942, is as follows: “Every kind of machinery upon which we can lay our hands is being used for drainage purposes to try to diminish the need for labor * * *. Unfortunately there are thousands of miles of ditches which are not doing their jobs, and in consequence tens of thousands of acres are waterlogged and cannot produce maximum crops. Ditches are the key to the whole drainage problem, and I want farmers, landowners, farm workers and my committees to make it their watchword to fight to the last ditch.”

For REFERENCE

Compiled by **ETTA G. ROGERS**, Publications Unit



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TEKEL

UPHARSIN

As though made for the eyes of a Belshazzar, this ominous camera-message to the Axis tells of the concerted might of an aroused democracy.

Here in close companionship are symbols of sure triumph by the United Nations. Here are suggested the efficient, modern methods of free farmers—stripped fields that are pathways to high production. Here is a home with vegetable garden—and remember that, however humble it may be, the home of the American soil tiller is his “castle.” Here spread proud wings to blazon the challenge of the fighting western industrialism.

These three must inevitably prevail—free farms, free factories, and free men. In the air, on the land, they are writing the early doom of aggressor Nations.—W. B.

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WELLINGTON BRINK
EDITOR

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SOIL CONSERVATION

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This field on a sloping hillside has been revegetated and will be permanently retired to grass. A good stand of crested wheatgrass is beginning to show.

DUTCH IMMIGRANT FARMS FOR FREEDOM IN A NEW LAND



Henri Folmer.

By V. P. McCONNELL¹

FORTY-TWO YEARS ago Henri Folmer was born in Holland in the heart of a prosperous agricultural region. As a boy of 13, he felt the electric shock that vibrated throughout Europe. War had started—and war spread. He saw the red sky of burning Antwerp and for 4 years heard the continuous booming of cannon on the nearby front.

Finally, a war-weary Europe found peace again. With his countrymen in neutral Holland, Henri Folmer celebrated the signing of the Armistice. In-

spired by Woodrow Wilson and American idealism, he dreamed of a new and better world that would rise, phoenixlike, from the ashes of the old.

For years, a Europe of promises and hope. A League of Nations struggling but impotent. Again the threat of war returned, this time under the leadership of two power-seeking men—one in Berlin and one in Rome. Henri Folmer held little hope for peace, and he dreaded the prospect of another European conflagration. In 1936, he sold his belongings and migrated to America.

At first, the Folmer family lived in New York City. Then, following the old tides of migration, they moved westward to Chicago. For 4 years, Henri Folmer prospered in his adopted land—prospered until his health broke and doctors told him that he must go even farther west to a high, dry climate.

¹ Work unit leader, Southwestern Region, Soil Conservation Service, Estancia, N. Mex.

After the doctors had given their decision, the first thing Henri Folmer thought of was farming. After all, he was a farmer at heart. He had been reared among peaceful farm folk. Two of his uncles in Holland had even gained some renown for introducing the first tractor into the country.

There was, to be sure, plenty of rich farm land in Illinois, Wisconsin, and Indiana, but low altitudes were out of the question. The fear of buying the wrong place weighed heavily on his mind, and he wrote to the United States Department of Agriculture for advice. A fruitful correspondence ensued with W. D. Blackley of the Division of Farm Management. The Chicago cliff dweller, armed with something more realistic than the vague advice to "go West," traded his car for a truck and started his expedition toward the setting sun in December 1940.

In 3 months, the Folmers traveled more than 14,000 miles. Day after day, they looked at farms and ranches. They traveled over the frozen stretches of Wyoming and Montana. They drove hundreds of miles over country roads in Colorado and Wyoming. They sped across the desert and priced land in California and Arizona. By the process of elimination, they finally thought that New Mexico might give the right answer to their problems.

New Mexico had a sunny climate and ample land at a price the immigrants could afford. After 6 months of searching, Henri Folmer found two dry-land farms which lie along U. S. Highway 66, about 30 miles east of Albuquerque, in the wooded hills overlooking the Estancia Valley. In this particular area, the average annual rainfall is 16 inches—enough to raise pinto beans and livestock successfully. The mile-high altitude was just what the doctor had ordered!

Mr. Folmer knew that his real work had only begun with the purchase of the land. He saw that the short, sparse grass was much different from the luxuriant grasses of his native land, where 12 acres were sufficient to graze 12 cows. He noticed the steep slopes, the gullies in the cultivated fields, the sagging fences, the inadequate water supply, the run-down buildings. Most important, he realized that valuable topsoil was washing away each year. Mr. Folmer went to the Soil Conservation Service for help.

Soil Conservation Service technicians made a survey and presented their plan for land improvement. Mr. Folmer heartily approved the plan and soon CCC men, stationed in a camp at nearby Edgewood, started to work. They built and repaired more than 2 miles of fence, plugged dozens of gullies, and constructed a stockwater dam.



Going over details of cooperative agreement; Henri Folmer, at left, V. P. McConnell, SCS man, at right.

When the CCC camp was closed, Mr. Folmer went ahead enthusiastically with the work. He has completed his boundary fence, cleaned out old wells and equipped them with storage tanks, terraced four cultivated fields, reseeded some land unfit for farming, and planned a scientific crop rotation. Corrals have been built and barns repaired. One new well, 545 feet deep, has been dug.

Mr. Folmer wants to put down roots into the New Mexico hills and he has projected many plans into the future—jobs that will be done as soon as time and labor permit. With the help of the Range Development Service of the General Land Office, he is enclosing the public domain lands that make up part of his pastures. Cross fences in pasture land will enable him to use a system of rotation and deferred grazing. Another well will be dug. And then there's his home, already nearing completion.

It will be truly a home, not merely a house, for Mr. Folmer hopes to spend the rest of his days in the sunny Southwest. When he considered a building site, he noticed that most of his neighbors built their homes near roads. At first, he thought he should do the same, but an innate desire for quiet and seclusion eventually led him to select a site behind a small wooded hill.

From his doorstep stretches a magnificent panorama—the wooded Sandia Mountains on one side, the treeless expanse of the Estancia Valley range lands on another, and the snow-crested Sangre de Cristo Range far in the distance. Wisely, he is using native materials for his home—rocks for the foundation and huge tree trunks (*vigas*) to support the roof. He is his own contractor, his own architect, and he has hired neighbors to help with the actual construction.

Mr. Folmer recalls the rich farm land and the well-kept farmsteads and barns of his native Holland. Except for disruptions of war, which the peace-loving Dutch avoided pretty well until Hitler's armies swarmed in, most Dutch farmers have led a stable kind of existence, with generation after generation zealously guarding the fertility of the land. So, to Mr. Folmer, this New Mexico home must be a permanent and pleasant haven. To make life more pleasant, the Folmers will have a flower garden, vegetable garden, vineyard, and orchard.

Mr. Folmer terraced four of his cultivated fields. The story behind the building of these terraces deserves telling. Before Mr. Folmer purchased the land, the former owner, in cooperation with the Soil Conservation Service, had terraced one field. Looking at the field, Mr. Folmer recalled the stone bench terraces that he had seen in the hills of Switzerland. "Why not terraces here too?" he mused. "We'll see what effect they have on crop production."

The first year of farming convinced him that terraces pay in sloping hill country. On the terraced field, he harvested 500 pounds of pinto beans per acre. On a nearby unterraced field, he gleaned only 150 pounds per acre. To Mr. Folmer, that was convincing evidence, particularly when he noticed that erosion had stopped on the terraced field.

Since the newly formed Edgewood Soil Conservation District, which includes the Folmer farm, did not have machinery available for terrace building, Mr. Folmer bought a small terracing machine. On four fields, he has built terraces and division ditches and developed grassed drainageways wherever they are needed. Water is precious in the semiarid bean country, and terraces help to hold every vital drop.

Several small strips of land, broken out in draws and badly eroded, have been returned to permanent grass. Mr. Folmer bought some of the grass seed and the Edgewood District is furnishing the remainder. Altogether, about 50 acres of badly eroded land have been revegetated.

Naturally, Mr. Folmer is planning his farm so that he will earn sufficient income for his family; but more important just now is his desire to help America—truly a land of freedom and security for him—in the eventual overthrow of dictatorial rule in the world. Because of poor health, he is disqualified for military service. But food—that's important too. So beans and meat and milk will be Henri Folmer's contribution to the shaping of a free world.

Of the 545 acres of cultivated land on his farm, about 400 acres will be planted in pinto beans this year. As everyone knows, beans are a war crop—a food high in protein, easily shipped, safely stored. The Nation needs more beans, and by the end of 1943, Henri Folmer should harvest something like 200,000 pounds of strength-giving pintos. Beans will be grown in a rotation with feed crops of small grains, corn, and sorghum.

As rapidly as possible, Mr. Folmer is building a small herd of Jersey cows. With three cows already on the farm, he intends to be milking at least a dozen Jerseys before the end of the year. A few head of purebred Hereford cattle form the nucleus of his breeding herd for beef cattle, a herd that will be gradually increased to the carrying capacity of the range. Mr. Folmer is so proud of his livestock that he plans to build a corral near the highway as a sort of showplace for people who pass by.

Besides crops and livestock, Mr. Folmer also will get some income from piñon and juniper trees on his range land. Naturally, he doesn't intend to chop down all of the trees. Instead, he will thin out dead and mature trees each year according to the recommendation of Soil Conservation Service foresters and will use this wood as fuel for home use and for sale.

Some people may believe that Mr. Folmer's ambitions encompass too much for an ordinary lifetime. Mr. Folmer would disagree with them. He is farming for tomorrow as well as for today. He is rap-

(Continued on p. 235)



The permanent home being built by Mr. Folmer in the piñon-covered hills of New Mexico.



Alva Marie Shepherd, daughter of Mr. and Mrs. Alvin M. Shepherd, of Nelson County, enjoys working in the family Victory garden, as well as doing other farm work.

CONSERVATION FARM- ING AND LABOR

BY R. J. FISHER¹

DOES CONSERVATION farming require more labor? Variations in types of soil, lay of land, kind of equipment used and the ability of the operator to manage—each has a distinct bearing on labor required, cost of production and whether or not the farm will be prosperous.

If one is thinking of labor required to handle certain jobs on an average farm under a conservation plan, the answer to the question is *yes* because of the following:

1. On the average farm where strip cropping and/or terracing are followed, the strips are of irregular width, requiring additional time to prepare land, cultivate and harvest crops.

2. Terraces require maintenance and are sometimes objectionable from the standpoint of using heavy machinery.

¹ Chairman, District Supervisors, Thomas Jefferson Soil Conservation District, Gordonsville, Va.



Soil conservation includes sound pasture management. Shown here is a portion of the large, well managed pastures on the farm of Dr. J. W. R. Smith.

3. In some instances when a farm is rearranged more fencing is required.

4. Following the setting up of a conservation plan, per-acre yields increase and more labor is required for harvesting.

On the other hand, if one is thinking of labor required per unit of production, the answer is *no* because of the following:

1. The farm is planned so that each piece of land will be devoted to the production of the crop to which it is best suited. For instance, the more level land is put in row crops and the steeper, rougher land in pasture, permanent hay or woodland. The shifting of crops from the steeper to the more level land generally will result in a saving of labor.

2. It usually follows that the rearrangement of a



White oak timber sawed from the Edgar L. Bradley farm near Carter's Bridge, Albemarle County, will be used for shipbuilding. Most of the trees from which this timber was sawed were more than 70 years of age.



One of the many better land use patterns seen on farm of Dr. J. W. R. Smith, who is owner of the Chadwell Estate in Albermarle County, birthplace of Thomas Jefferson.

farm results in a reduction in acreage of cultivated land, although the total yield generally is increased. For example, on one dairy farm in the Thomas Jefferson Soil Conservation District, 50 acres of corn yielded 90 tons of silage in 1936. Five years later, following strip cropping and other conservation practices, the farmer reduced his corn acreage to 40 acres, and made 400 tons of silage besides shucking out 100 barrels of corn. This same farm usually bought hay to carry the cattle through the winter. At the end of a 5-year period, after wintering 80 head of cattle, an increase of 74 percent, he had 10 tons of hay left over. (As you remember, 1941 was somewhat of a dry year). While this increased production was be-



This pasture on the farm of Donald B. Kane, near Charlottesville, in the Thomas Jefferson soil conservation district, has been contour furrowed, fertilized, limed, and seeded two years.

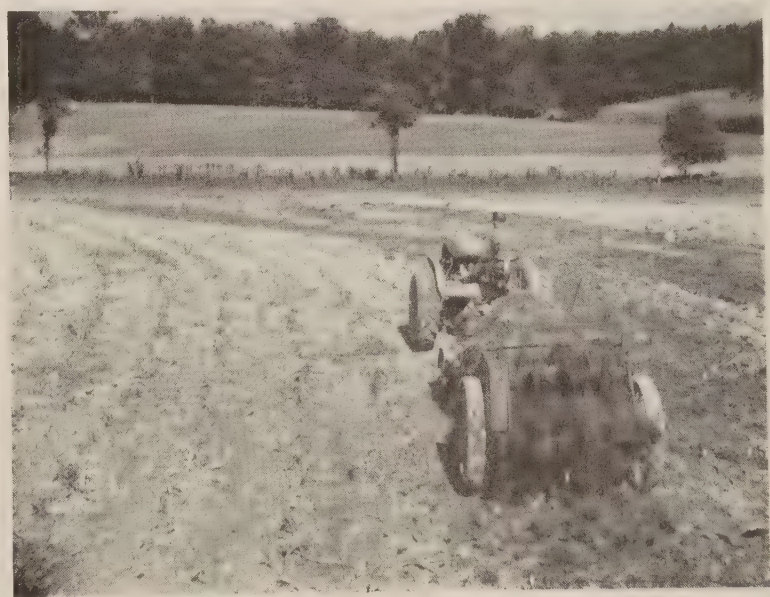


Like many other farmers in the Thomas Jefferson soil conservation district, Paul Black, of Albermarle County, is clearing fertile bottom land for pasture. This practice relieves pressure on upland for a more diversified system of row crop farming.

ing obtained the total number of laborers that were required on this farm was reduced.

A sample survey was conducted by Lyman Carrier within the 14 soil conservation districts in Virginia, including 120 farms that were following a conservation plan. This survey showed a decrease of 16 percent in corn acreage, with the gross yield increased from 12,500 bushels to 19,200 bushels, or a total increase of 36 percent.

3. The expense and labor required in changing to and maintaining conservation farming will be more than offset by labor saved on gully and gall repair, as well as a saving of labor required to clean out lowland drainage ditches that have become filled with



A heavy application of barnyard manure in August, following a crop of corn, is very helpful where grain will follow in the fall. This practice, as shown on the K. B. Wyeth place in Albermarle County, is common throughout the district.



Vineyards on contour to safeguard fertile hill land against erosion; tended by the Catholic Institute at Lewis Mountain, which cooperates with the Thomas Jefferson soil conservation district.

soils from those gullies on the upland, to say nothing of the saving of the farmer's most valuable asset, topsoil. In the Valley of Virginia, on Route 11, one 12-acre field was planted to corn with the rows running up and down the slope. In June 1941, one sudden shower deposited soil from this field on the highway 18 inches deep. The Highway Department sent up 5 trucks to move this debris from the road. The farmer furnished labor to load this soil on the trucks; 91 tons of it was hauled back on the field. This, all in Virginia.

4. From all the information that I have been able to secure the amount of returns per man-hour spent



Dr. J. W. R. Smith spends most of his time working with tenants on the farm. Here he is seen spreading lime on land which has been prepared for small grain. He is a cooperator in the Thomas Jefferson soil conservation district.

on the farm is greater on those farms practicing conservation farming than on those that are not. As Dr. T. B. Hutcheson says, "All that a farmer has to sell is plant food and labor." If he loses nine-tenths of his plant food before it gets into crops his labor cannot be used very efficiently. So, the more plant food used by crops, everything else equal, the more returns he gets per hour for his labor.

We find, too, that as one develops a plan the work becomes easier. Instead of a drudgery, work becomes a pleasure. Carrying out a well-laid plan creates in a man a certain amount of pride that is hard to obtain by doing work in a haphazard way.

NOW THE FARMERS TELL US

BY L. R. COMBS¹

FOR TEN years men of the Soil Conservation Service have been telling farmers that contour tillage will check erosion, increase yields and reduce production costs. Now with war production in full swing the echo comes back from the country, amplified a thousandfold, to indicate that soil conservationists have not been "shouting down a bottomless well."

Today farmers are telling the Service that contour tillage is a good thing. They tell it in no uncertain terms. Their statements are backed by higher yields and income, more livestock feed, diminished erosion, less machinery wear and breakage due to crossing



Contour plowing on the R. and C. Mulliner farm, Northfield, Minn. Note the grassed waterway left to carry away surplus water which concentrates in the natural drainageways.

gullies, easier pulling for the horses, lower fuel costs because tractors run in high gear instead of low.

¹ Chief, Regional Division of Information, Upper Mississippi Region, Soil Conservation Service, Milwaukee, Wis.

Faced with the necessity of producing more food, oil and fiber crops, and in many instances already farming all the tillable land, farmers are finding that contour tillage is necessary to their wartime production plans. In the dairy, pork, and beef areas, higher crop yields and better feeding mean more meat and milk and butter.

Since farmers themselves are giving the Service the ammunition we can and are using to best advantage today, I will let them tell their own story:

O. L. Gustafson, operator of a 420-acre farm in Marshall County, Ill., drilled 90 acres of corn on the contour last spring, using furrow openers. The corn was rotary-hoed three times and cultivated once. The average yield was 80 bushels an acre.

"No wire was used when planting, so I saved time on that operation," Gustafson said. "The furrow openers put the corn in 3- or 4-inch furrows, and using a rotary hoe gave me as clean corn as I've ever had. I had 60 acres of checked corn this year which averaged 60 bushels. I know that drilling on the contour gave me 10 bushels more per acre. The other 10-bushel increase was the result of more rainfall, sweetclover, and manure. I have seen water standing in the contour corn rows after a rain. Water held like that produces corn instead of gullies."

He also drilled 70 acres of soybeans, using the same planter and furrow openers that he had used for corn.

Gustafson said he not only saved soil and moisture and increased yields to meet war demands, but increased his pork and lamb production about 50 percent.

Over in Iowa is Robert Hiatt, another farmer who no longer thinks that a straight furrow is necessarily the trademark of the best farmer. On his Jefferson County farm he obtained a 4- to 5-bushel increase in soybean yields per acre by contouring.

"It required less time to cultivate these beans," said Mr. Hiatt, "because I could keep my tractor in high. I save 3 or 4 gallons of fuel per acre because I was on the level all the time."

This year he plans to plant all of his corn and soybeans on the contour.

In Indiana's Grant County soil conservation district, George Heinlein planted soybeans on the contour in one field and in straight rows on an adjoining field of similar slope, soil type and productivity.

The contoured beans yielded 22 bushels an acre, or 4 more than the old-fashioned up-and-down-hill field. Mr. Heinlein stated that the only difference between the two fields was the contouring.

Chris Mueller, Sauk County, Wis., found that he saved 17 percent in tractor power by farming on the



Glen Stuckert, son of Henry Stuckert, cultivates corn on the contour on his father's farm near Oconomowoc, Wis.

contour. Harry Powell of the same county says, "I saved 2 hours' time by contour cultivating an 8-acre field."

These individual farmers' experiences are merely examples of hundreds of similar cases in the Upper Mississippi Region, that might be cited as evidence that a straight line is no longer the shortest route to the highest yields. As further convincing evidence let us look at the results of a survey made in the Crawford County, Iowa, soil conservation district:

Inquiries were sent to farmers who had been following the crooked row on at least part of their cultivated fields. Most of them did not have strip cropping or terraces. Of 179 farmers answering, 178 reported that contouring saved soil; 161 reported it saved moisture; 171 reported that it increased their corn yields, and 80 reported increased grain yields. The average per-acre increase in corn yield reported was 11 bushels, and in small grain, 10 bushels.

One hundred and one farmers reported that weed control is no more difficult in contoured corn than in check-rowed corn. Asked if they intended to continue contour tillage this year, 157 answered "yes" and 123 promised that their entire farms would be on the level.

The Winneshiek County, Iowa, soil conservation district made a similar survey, sending inquiries to 235 farmers and receiving 153 replies—a return which

would warm the heart of any commercial advertiser and in itself an indication that farmers are really interested in the "crooked, crazy-quilt" type of farming that many of them scorned a few years ago.

The Winneshiek County survey, however, includes all contouring—that in strip cropped and terraced fields as well as plain contouring. Ninety-eight farmers reported increased corn yields—the increase averaging 10.5 bushels an acre—while 45 were undecided or didn't know. Ten reported "no increase." One hundred and three reported noticeable savings in fuel and power, the average fuel saving being 12 percent.

So the reports run on farm after farm through the Corn Belt; and research results indicate that the conclusions of practical farmers are accurate.

Studies in Illinois under the direction of Elmer L. Sauer, project supervisor, Division of Economic Research for 3 years, 1939 to 1941, give contour tillage an advantage of 7.7 bushels of corn per acre, 3.3 bushels of soybeans, and 10.2 bushels of oats. These averages are based on yields taken from farm records of operators who grew the same crop both on the contour and in straight rows on the same farm.

In a study of operating costs, Mr. Sauer matched 135 contour farms with 135 comparable neighboring straight-row farms. Horse and machinery costs and labor costs per crop-acre were practically the same, the few cents difference being in favor of the contour farmers. Tests on some of the soil conservation experiment stations give similar results.

To see a farmer laying out his own lines and establishing contour tillage no longer is uncommon, and many more will do so this year after attending

training schools or demonstrations on contour layout conducted by Service men, county agents, AAA committeemen, vocational agriculture teachers and others.

Farmers are using inexpensive hand levels and homemade devices for laying out contour lines. Several different types involving use of a carpenter's level have been made. Another, developed in Wisconsin this winter, uses the principle of a weight which holds the sights level when the instrument is in use. This homemade level, developed by a Soil Conservation Service technician, is explained in a new leaflet, "'Round the Hill Farming," published by the Wisconsin State Soil Conservation Committee in cooperation with the Extension Service. In Indiana the adaptation and use of the carpenter's level has been demonstrated to AAA committeemen in 60 county training schools. Committeemen cooperating with Service men and county agents are holding similar demonstrations for groups of farmers.

Gerald Crone, AAA committeeman in Rock Grove Township, Stephenson County, Ill., staked out his own contour lines last year using a homemade carpenter's level. He learned the method at a demonstration conducted by a Service man on a neighbor's farm. He reports that contour planting took less time and his yields were increased. One of his neighbors, Art Laible, also contoured his corn and obtained a yield of 130 bushels an acre.

Contour tillage is one of the practices selected for emphasis by many county war boards as methods of increasing production and conserving soil in 1943. A majority of soil conservation districts throughout the region that are cooperating with the Soil Con-



A contour-plowed strip in Kansas, where farmers are using conservation methods in their fight for top production.

ervation Service, the AAA, the Extension Service and other agencies in the conservation-production practice program, are stressing contouring. Several have prepared simple mimeographed leaflets quoting farmers on their experience with contour tillage and other practices. One, published by the Sauk County (Wisconsin) district and entitled "A Contoured Field Will Better Your Yield," includes 1-sentence or short-paragraph testimonials from 29 farmers about increased yields, saving of power, time and machinery, and conservation of soil, fertility and water from contouring and strip cropping.

Farmers and representatives of the agencies work-

ing on the production-conservation practices program recognize that grassed waterways go hand in hand with contouring. Likewise, strip cropping and terracing go along with contouring on many slopes and soils. But farmers and soil conservationists in the field see the basic practices of contouring and grassed waterways as a starting point and are using them as such. This is assuming that adequate rotations and soil treatments have been applied. Other practices and the complete plan will come later—many farmers who have just started their conservation program via the plain contour route will tell you this.

INDIGENE TERRACES IN VENEZUELA

BY JOSE ANTONIO RUGELES¹

THE WORLD offers simple, but very important, reasons to prove that soil conservation is a universal and collective necessity. If man, as a product of nature, struggles to take care of himself and to study the best means of subsistence, it is logical—more than logical, it is essential—that he must also take care of such resources as water, vegetation, and soil, without which he could not live. Man without land and water would not be man.

Did our aboriginal ancestors perhaps understand this better than we do?

We asked ourselves this question recently, as we looked at the ruins of terraces constructed by Indians of the Venezuelan mountain country. For, actually, along the slopes of the region called Mucuchies, in the Cordillera of the Andes in Venezuela, inhabitants of a thousand or more years ago were working to conserve the soil in which they grew their wheat and potatoes. These lands are cut sharply steep. Generally speaking, the valleys have a minimum grade of 8 percent, while in the hills the grade rises from 20 to 90 percent—and even, sometimes, higher. For the last 300-odd years these lands have been cultivated without any methods of conservation. Millions of tons of soil are lost annually, washed away by rivers and rains, and the penalty of men who work exhausted terrains is slowly being meted out. Today many of the Andes' majestic hills

are split with fissures and crevices, like the wounds of a being mistreated by man.

Nevertheless our Indians of Mucuchies, as civilized in this respect as the progressive Incas of Peru, used to have terraces. In San Roman hill, which lies in our wheat country at 3,200 meters above sea level, there still remain more than 12 almost complete terraces, overgrown with weeds and deteriorating from years of abandonment. As is well known, the construction of terraces for erosion control is fairly difficult; to make it work, it is necessary to calculate the resistance of the soil to the washing away caused by rains, which depends chiefly upon the slope of the land. The Indians of Mucuchies took all this into account, as we saw when we visited the terraces with Dr. D. S. Hubbell, head of the Soil Conservation Commission, who worked in Venezuela during 6 months of 1942. The terraces were built of stone on a 30-percent slope, with a small projecting edge of the cultivable area. They run a little over a meter (4 feet) high, and about 60 meters long.

Today, when the world is bitterly engaged in one of its greatest battles, it is comforting to think back about our native ancestors. They, within their primitive existence, were able to leave us signs of what could be called an *intuitive understanding of nature*. We of this century of modern civilization should be preparing ourselves to leave to our future generations a better heritage than that of war. Through the efforts of united humanity we can erase the scars of battle.

As Americans, sons of the Greater America which reaches from Alaska to Magallanes, we have a great deal to do for the future of our continent. Let us do it in fraternal harmony, studying together the utilization of our immense resources, but not forgetting that these resources must have the protection which will make them last.

¹ Agriculturist of the Ministry of Agriculture of Venezuela, and Venezuelan representative on the program of the Soil Conservation Service for Latin America.

DRAINAGE FOR COASTAL PLAINS AREA



J. C. Hudson (left), landowner in Atkins drainage district, discusses new drainage program with W. W. Player, president of the drainage district.

BY BARRINGTON KING¹

DOWN ALONG the Atlantic and Gulf Coastal Plains of the Southeastern Region lie vast areas of potentially productive but poorly drained agricultural land. W. W. Player, president of the Atkins drainage district in Lee County, S. C., describes it as "maybe land" . . . "Maybe you'll make a crop on it, and maybe you won't." But in total war there must be no "maybe's." We know down here that maximum, sustained production must be carried through to the end of this war—and for some time after.

Fortunately, a sound land use program already is beginning to take shape in this area; it is expected that it will make a material contribution not only to the war effort, but also to the welfare of the people who live on the land in spite of the fact that several problems remain to be worked out. Inadequate drainage constitutes a serious health menace and many of the people suffer from malaria. The uncertainty of crop production makes the economic position precarious, especially for the small land owners and tenants who live on the farms, hoping during a good year to make up for their losses during wet seasons.

It was with high hopes that a group of farmers gathered in the Atkins drainage district on December 2 to see the final excavation of a 3-mile drainage

canal north of the town of Lynchburg, S. C., and to celebrate the event with a barbecue. Completion of the new canal represented the first major step in a broad-scale drainage and conservation program that will affect 14,500 acres of land in the drainage district and will serve as a demonstration of a community type drainage program for similar land.

Drainage programs are not new in the flat Coastal Plains areas of the South, and the history of the Atkins drainage district is like that of many other drainage projects. The district was organized about 20 years ago and the public drainage system was completed in 1929, just before the depression. No provision had been made, however, for technical as-



Fred Thompson, district conservationist, discusses plan for proper land use with Henry Benjamin, Negro farmer, following completion of new drainage canal.

sistance to farmers in developing farm drainage and at that time very few landowners were financially able to construct drainage facilities on their farms to take advantage of the public outlet system. Consequently, deterioration of the drainage system set in.

When the Lynches River Soil Conservation District was organized in 1940, comprising 1,000,000 acres in Lee, Kershaw, and Sumter Counties, S. C., it was recognized that drainage was one of the principal problems and that land in the Atkins drainage district typified this problem. Consequently, the South Carolina State Soil Conservation Committee and the Soil Conservation Service selected the Atkins drainage enterprise for a drainage demonstration.

¹ Information Specialist, Southeastern Region, Soil Conservation Service, Spartanburg, S. C.



Pent-up water in old drainage system rushes through new canal as final excavation is completed, providing an outlet into the Lynches River.

The Service made an intensive survey and other investigations necessary for the development of a plan of operations and agreed to cooperate with the supervisors of the Lynches River district in the rehabilitation and improvement of the public drainage system. The investigations showed that drainage improvements were necessary on 75 to 80 percent of the land in the drainage enterprise, and that with adequate drainage, a well-balanced agricultural program could be introduced and maintained, public health could be improved, and land and property values increased.

In the proposed over-all drainage program, with the drainage district, soil conservation district, Soil Conservation Service, and other agencies cooperating, for the first time facilities will be provided for technical assistance to farmers in planning individual farm drainage for effective use of the public outlet system. This assistance will be furnished by the Soil Conservation Service as a part of complete farm conservation plans developed in cooperation with the soil conservation district. Under mutual agreements, equipment and facilities will also be provided for adequate maintenance of the drainage system.

Although all the land in the drainage district will benefit from the new program, the principal benefit will be for 9,651 acres of class III land. This is good agricultural land—Mr. Player says it is as good as any in South Carolina—but owing to lack of adequate drainage, crop production on this land is uncertain and complete crop failures often occur during wet years. It is estimated that the value of this land will increase \$20 an acre, or a total of \$193,020.

Estimated increases in value of all classes of land in the drainage district expected to result from the new program are as follows:

Land class	Acres	Increase per acre	Total increase
I	2,281	\$10	\$22,810
II	1,663	15	24,945
III	9,651	20	193,020
IV	778	10	7,780
Total			\$248,555

A conservative estimate of the over-all benefits can be arrived at by assuming a 5-percent annual return on the increased land values resulting from the proposed improvements, or \$12,427.75 annual benefits from the improvement program.

"Talk about increasing crop yields to aid in the war effort!" exclaimed Fred Thompson, district conservationist of the Soil Conservation Service. "You can increase yields 100 percent in 1 year with proper drainage on this kind of land. The soil is well adapted to growing pasture grasses, hay, corn, and other crops needed to produce milk and meat for the war program. And you don't have to convince people of the value of drainage. They are willing and anxious to get started."

Farmers in the drainage area bear out Thompson's assertion. They have been laboring under serious handicaps. For example, Joseph C. Hudson, whose 103-acre farm lies at the point where the new canal joins the old drainage system, says that owing to heavy crop losses on his 53 acres of cultivated land, he was ready to quit, until the new drainage

program was started. On land that will make a bale of cotton to the acre in a dry season, he made 4 bales on 14 acres this past year. He lost 8 acres of hay, 11 acres of corn, and 1 acre of tobacco, in addition to damage to other crops.

C. A. Vincent, farmer, cotton buyer, and fertilizer dealer at Lynchburg, has 250 acres of fairly high land. His farm is less subject to damage during wet weather than the average land in the community, but a considerable acreage he had planted to small grain for winter grazing stayed so wet for 2 months that he was unable to turn his cows on it.

S. E. McElveen, also of Lynchburg, made only 57 pounds of seed cotton on 6 acres last year and lost an adjoining 6 acres of corn.

"You couldn't walk across the field for 7 weeks," he said.

Isaac Evans, Negro farmer who owns 130 acres near Lynchburg, told us that he planted 2½ acres of peanuts in 1942 "to help the Government," but that he didn't even get his seed back. He also lost 10 acres of corn, out of 30 acres planted, 10 acres of peavine hay, 6 acres of oats, 3 acres of cotton, and 1 acre of tobacco.

"I would have been in a bad fix for hay if the grass hadn't taken my cotton," he said. "I just harvested the grass for hay, and that will have to carry my stock through the winter."

The economic plight of some of the small farmers is well illustrated on the farm of Henry Benjamin, another Negro farmer, who said that to carry his family of six through the winter last year he had only one 50-pound shoat, 12 gallons of sorghum syrup, 20 bushels of sweetpotatoes, and a little corn for cornbread.

"I never made a money crop at all last year, and didn't do much better this year," he said.

Henry was born within 2 miles of the farm where he has lived for the past 35 years. The farm was left to him by his mother, but 2 years ago, after several bad crop years, he lost the farm and has just stayed on there since that time as a tenant.

In good years, he has made from three-quarters of a bale to a bale of cotton per acre on the little 30-acre farm, but last year he made only 70 pounds of lint cotton on 6 acres. Most of his corn drowned out, but where he had bedded it high he made a few nubbins, enough to provide meal for corn bread.

Five acres of peavine hay that he planted was a total loss, and he made only 5 bushels of grain oats on 5 acres. Water stood on his land so long that three of his four hogs died, and he had to kill the last 50-pound hog for meat to carry him through the winter.

But Henry, like other farmers in the drainage area, is expecting good crop yields every year now that the new drainage canal is in operation.

"If this land is dry, nothing will beat it," he declared.

When the original drainage system was constructed, an attempt was made to carry all the water in a westerly direction to the Black River. This actually increased the drainage problem on the east side of the district, owing to failure of the drainage system to function as intended. Besides damaging cropland, the water that overflowed from the old drainage canal followed a natural outlet through the town of Lynchburg where it created a problem for the town, highway department, and railroad.

When the new drainage program was undertaken, the first step was to provide an outlet on the east side into the Lynches River through the new canal. This will give immediate relief from overflows for farm land on the east side of the district, will provide a diversion for water that has been flowing through the town of Lynchburg during periods of heavy rainfall, and will reduce the volume of water that the old drainage system had to handle through the single outlet into the Black River.

The new program will not bring any considerable amount of new land into cultivation, with the exception of cut-over woodland that may be cleared for crop production after adequate drainage has been provided. Nevertheless, it is expected greatly to increase production on existing cropland by eliminating the hazard of crop failure due to inadequate drainage. On much of this land in the past, a crop has been produced on the average only once in about every 3 years, according to District Conservationist Thompson.

Combining a sound drainage program with the development of complete conservation plans for individual farms, including assistance to farmers in planning their farm drainage, is a new approach to this problem in the Southeast. With the widespread development of farmer-organized and farmer-operated soil conservation districts, it provides a basis for sound utilization of extensive areas of land that are vitally important not only to increased production needed in the war effort, but to a longtime conservation program.

*Said the little raindrops to the little rill,
"Mind if we join you and race down the hill?"
Quick came the answer: "It's O. K. by me,
"I'm headed for the ocean and would like company.
"We'll wash out a channel, amazing to see,
"And when the rains are over, what a gully there will be!"
"Pipe down," growled the terrace, "You won't get by me!"
"So you'd better join the Navy, if you want to go to sea."*

—Inez P. Kishton, Magazine S. C. District.

MORE FOOD WITHOUT WASTE—MISSOURI'S GOAL

BY K. G. HARMAN¹

Missouri's program of increased production is based on soil conservation, to help guarantee sufficient food not only for winning the war but also for writing and keeping the peace.

Millions of people in Europe and Asia will be clamoring for food when this war has ended. We want to be in a position to satisfy their needs, both for their sakes and for the sake of our own national well-being in the future. Thus America must be in a position to produce enormous quantities of food for several years—probably 10 or more. The study of production goals should be approached from a long-time viewpoint, with consideration of all factors that will give maximum sustained yields over that period. A thorough inventory of the soil resources of a State should be taken as a basis for setting up goals. The goals should then be adjusted so that high production may be safely maintained for this and a longer period of time.

Missouri has launched a program to obtain maximum food production without serious soil waste. Key crops in this program are small grains and legumes. Other erosion-control practices tied in with this cropping program are contour farming, terracing, and improvement of pastures and meadows.

Experiences of more than 4,000 farmers—in 42 Missouri counties—who cooperated with the Soil Conservation Service in applying complete soil-saving plans have proved the effectiveness of conservation farming to increase food crops. Although they have decreased their acreages of cultivated crops an average of 30 percent, their total food production is up, their cost of production is down, and their soil resources are being conserved. These 4,000 farmers are representative of the State's agriculture, including both owners and tenants on good, medium, and poor land. Their results should be a logical guide to goal planning and sustained production.

¹ Acting State Conservationist, Soil Conservation Service, Columbia, Mo.

The accompanying table shows the increases in animal-unit production on four farms as a result of conservation methods. These farms have varied soil types and are at widely separated points in the State. They also vary considerably in size, and are used primarily for livestock farming. The increase in animal units, ranging from 25 to 55 percent on the four farms, has resulted almost entirely from soil improvement and conservation practices on small grain, meadow, and pasture.

Missouri farmers could greatly increase the total production of cultivated crops by plowing up meadow and pasture land, but the disastrous effect of this method was proved conclusively in World War I. Furthermore, an increase in the acreage of cultivated crops might actually decrease the output of dairy and meat products which are even more essential now than corn and wheat. Other disadvantages would be the need for more farm labor, and an eventual decline in food production capacity.

The advantages of the small grain-grass-legume type of farming, listed below, are readily apparent and are fully recognized in the Missouri plan.

1. Soil resources will be preserved and soil fertility restored.
2. Our victory can be backed up with food for peace.
3. Dairy and meat products will be increased.
4. Quality of food will be better.
5. Cost of production will be lower.
6. Less labor is required.
7. Dangers of livestock disease will be lessened.

The crops department of the Missouri College of Agriculture has emphasized the value of small grain-lespedeza farming from the standpoint of beef, mutton, and dairy production. While it does not offer as many possibilities in pork and poultry production as in the others, yet the grain can be used

Changes in crop acreages and increase in animal units on four Missouri farms having complete soil conservation programs

Farm owner	Year	Corn		Small grains			Misc. hay		Alfalfa		Pasture		
				Oats		Wheat					Unimproved	Improved	Animal units
		Acre	Bu. per acre	Acre	Bu. per acre	Bu. per acre	Acre	Tons per acre	Acre	Tons per acre	Acre	Acre	
Eugene Glover, ¹ Fulton, Mo.	1934	10	25	10	27		20	1			27	0	18
		2	25										
	1941	12	50						11	3		45	28
Sam Caldwell, Washington, Mo.	1936	16	45	22	20		7	1			20		12
	1941	12	60	18	30		3	1½	14	3		22	16
G. W. and Lambert Seyb, Ashton, Mo.	1936	5	20	25	22	12	98	1			149		29.1
	1941	10	30	18	40	25+	70	1½			127	37	40.7
Henry Brooks, Eagleville, Mo.	1932	50	35	25	25		45	¾			70		30
	1941	26	43	19	37		34	1½	9	3		104.2	39½

¹ Mr. Glover grows no grain crops except as a meadow becomes poor or a pasture needs renovating. He follows a pasture-meadow system. ² Rented land.

for poultry. If barley is grown, the grain can be used for hogs, and lespedeza furnishes excellent hog pasture. It is doubtful if 50 percent of the production capacity of farms of this type in Missouri has been used to date.

This system is particularly adapted to soils of medium to low fertility, but it is also adapted somewhat to land of higher fertility. Increased production of small grain and lespedeza also can be obtained by soil treatment.

In addition to quantity of food produced, the quality is a vital factor. The Soils Department of the Missouri College of Agriculture has proof of the increased quality of feed produced from soils that have been given the proper soil treatments. It has been found that even legume hay grown on soils of low fertility will not give efficient gains and in many instances will not even sustain the animal, while legume hay produced on similar soils having proper soil treatments does give economical gains.

It is hardly necessary to mention the benefits of increased production through maintenance of soil fertility. It would seem then that, if we recognize

the benefits of increased quality, to which may be added the increase of quantity by proper soil treatments, every possible effort should be made in our goal planning to make full use of soil-improvement methods. Among the first goals that should be set are (1) to meet the fertility needs of our soils and (2) to establish good land use practices.

The Missouri College of Agriculture through its extension service has inaugurated a balanced farming project that encourages good farm management. Farmers cooperating in this program are coming together in groups and planning the use of their farms. Like the cooperators of the Soil Conservation Service, they are studying the factors involved in order to develop a balanced farm plan. They are using as a guide a soil-fertility standard that has been worked out by members of the Extension staff. Progress of this planning program indicates that farmers themselves believe that the most productive, economical, and profitable system for their farms is one that increases use of soil treatments, rotations, legumes and grasses, rather than one that increases cultivated crop acreages.

INTRODUCCIÓN A LA GEOGRAFÍA DE CUBA. By Salvador Massip and Sarah E. Ysague de Massip. Habana, Cuba, 1942.

In proportion to its size, no Latin American Republic is more vital than Cuba to the welfare of our own country. It spans the entrance to the Gulf of Mexico, and serves as a bridge between the predominantly Anglo-Saxon culture of North America and the Spanish culture to the south. The United States is not only Cuba's best customer for agricultural products but also the nation from whom Cuba purchases the greater part of its own imports. Because of this intimate relationship, we in the United States have a particular interest in Cuban agriculture and in the land that supports it. Basically this interest is geographic. It is geographic position, land forms, rock structure and overlying soil, climate, drainage, and native vegetation that determine our agricultural imports from Cuba. For this reason we in the United States welcome the publication of "Introducción a la Geografía de Cuba" by Doctors Salvador and Sarah E. Ysague de Massip.

In the past little has been written on the geography of Cuba, and most of that is widely scattered among various foreign scientific journals, not readily available to Cuban students. The Massips, therefore, have performed a particularly valuable service by assembling within a single volume, information from a wide range of English, German, French, and Cuban sources and integrating it into a unified whole through their own intimate knowledge of the island republic.

The book explains simply and effectively the sequence of geologic changes that created the landscape of today with its wide variations of agricultural potentialities and, consequently, erosion hazards. The presence of red soil underlain by limestones coincides the distribution of the most productive sugar lands. Where the land is underlain by

soluble limestone, surface drainage may be lacking and the resulting soil-erosion hazards are those characteristic of karst lands in any other part of the world. Accelerated surface erosion, by contrast, prevails where soils are underlain by less permeable rocks, such as the igneous rocks exposed at the center of an anticlinal fold by geologic erosion of the overlying sedimentary strata.

After a general discussion of the evolution of the geomorphology of Cuba, the Massips proceed with detailed descriptions of the four major physiographic provinces of Cuba—Occidente, Las Villas, Camaguey, and Oriente. On the subject of soils, they follow H. H. Bennett closely and the maps used to show the distribution of soil types are reproduced from Dr. Bennett's article in the *Geographical Review* for January 1928.

A particularly noteworthy feature of the book is the generous use of photographs, maps, and diagrams, which are in reality an integral part of the text rather than mere illustrations. The photographs, carefully selected to show types of land form and land utilization, are accompanied by long legends that emphasize and reduce to the specific, points developed in the text. The same is true of the numerous maps and diagrams. Since standard geologic symbols, common to all languages, are used throughout, even a person with but a slight knowledge of Spanish could learn much about Cuba from a careful study of the diagrams. The maps and diagrams were prepared by Dr. Erwin Raisz of the School of Geographical Exploration of Harvard University and are, on a whole, very effective. Occasionally, however, the illustrator has attempted to show too much in a single drawing or used too small lettering, thus sacrificing legibility. Unfortunately, the one large map showing the entire island of Cuba is woefully lacking in place names. This might offer little difficulty to a native Cuban but it is a serious limitation in this country, where few offices or even libraries possess adequate maps of Cuba.—Reviewed by Lois Olson.

FARM PLANS—TOOLS FOR PRODUCTION

By THOMAS L. GASTON¹

FROM TIME immemorial farmers have had farm plans; in fact, every farmer has a plan—for a day, a week, a month, a year, or for a longer period. Perhaps many farmers do not realize this. The plan may or may not be in writing—probably in most instances it is not—and it may consist of any combination of the myriad considerations essential to the operation of the farm or ranch. The methods of growing and harvesting a crop, or of handling a particular number of livestock may be the problems considered. Or a problem of soil management or fertilization may be the uppermost thought. Practices of tillage, marketing, etc., or improvement structures—dams, ditches, terraces or buildings—may be included. The plan may be in the nature of an inventory and income statement useful in guiding future adjustments. At least parts of the plan are quite flexible, as for example the seeding of a particular crop within certain dates if it rains, or perhaps, if it does not rain.

The general purpose of the farm plan is to serve as a guide for producing needed or useful crops or livestock, or livestock products, either or both in greater quantities or at less cost—during the ensuing season or for a longer period. In many instances the general purpose is wholly or partly accomplished, but frequently it is not. If the effect of uncontrollable factors, such as weather, insects, diseases, and market fluctuations is overlooked, the usefulness of the plans is perhaps proportioned to the soundness of the thinking and judgments entering into their formulation. Whether the result for a particular period is production of greater quantities or lessened cost, the effect has been “official,” insofar as thoroughness of thinking and soundness of judgment are furthered. In the field of agriculture, each kind of plan is important—the written and the unwritten, the simple and the complex, the specialized and the all-inclusive. For particular purposes, one type is more effective than the other, and in other circumstances, still another type.

During the last 25 to 30 years, with increased emphasis on public assistance to agriculture, farmers generally have given progressively greater consideration to their farm plans. This emphasis has been especially marked during the last 10 years. Some public agricultural programs have been geared with a single type of farm plan as a foundation. Two

or more types of farm plans have been the foundation of other programs, and various kinds of farm plans have been a partial foundation for still other programs. Some of the written plans are characterized by such terms as farm and home management record, farm and home management guidance plan, farm budget, soils management plan, rotation plan, water disposal plan, farm drainage plan, farm poultry plan, farm dairy plan, farm beef plan, farm irrigation plan, farm contour plan, farm terrace plan, ranch management plan, farm labor plan, farm conservation plan.

Generally speaking, the farm plan that is wholly or partially written, is more fruitful than the unwritten—and this statement is made with no intention of deprecating either the place or effectiveness of the unwritten. However, the expression in writing or diagrams of the thinking and judgments does lead toward a fuller scope of the circumstances and a more concrete visualization of contemplated fuller action. Furthermore, if written, the plan may be referred to from time to time as long as it is kept. More particularly is the written as compared with the unwritten plan significant if the plan is a foundation for a public assistance program. With the professional worker, who deals with generalizations and abstractions to a greater degree than the farmer, the writing facilitates visualization of the practical circumstances involved. If the worker helps the farmer develop and write the plan, the writing tends to help him to be practicable and thorough. In fact, the changing of personnel connected with a public assistance program—whether local, State, or Federal—almost necessitates that the type or types of plans upon which the program is based be written.

The farm plans which have soil conservation—continued production—as a basic purpose, in addition to either quantity production or lessened cost, may be classified in three groups as follows:

Specialized plan.—The scope includes only a single crop such as grass mixture for a particular slope; or a single practice—as contour cultivation, trashy tillage, or proper stocking of range land; or a single structure, such as terraces or small dam for catching silt, retarding run-off, or water spreading.

Partial plan.—This plan includes either a portion of what is practicable and feasible on the farm in the light of current knowledge, or only a part of the farm.

Complete plan.—The complete plan includes all that is practicable and feasible, in the light of current knowledge, on the entire farm as a unit.

¹ Assistant Chief of Operations, Soil Conservation Service, Washington, D. C.

Each of these types of plan is important to some farmers. Each is important in one or more public assistance programs. Each fills an important and effective niche in the farmers' and the Nation's objective to attain the needed production, present and future, of agricultural products.

The *complete* type of plan, written or unwritten, is commonly considered as an ideal approach for meeting the soil conservation problems on an individual farm or ranch—or for that matter, on a group of farms or ranches. Effective rotations are more easily adopted. Crops and livestock may easily be kept in optimum balance respecting pasture, hay, and feed needed. Terraces, contour lines, diversion ditches, and the like may cross two or more fields—or farms—with the greatest amount of effectiveness, least construction input, or minimum number of outlets. The most convenient field or wood lot lay-out may be attained. Rotations meeting soil or range management problems for maximum production can

be more easily followed and at the same time balance can be maintained between cash crops, pasture, and feed.

Farms or ranches upon which *complete* plans are applied may serve as invaluable guides, or “targets of effectiveness,” at which *partial* or *specialized* plans—whether written or unwritten—may be aimed. Naturally, the area where this purpose is served includes chiefly those farms within the locality having similar problems.

Each type of farm plan, and whether written or unwritten, has an important role in present and sustained production. It is to be hoped that as experiences are gained in public assistance programs the kinds of farm plans can be reduced and simplified, and this without losing sight at any time of the main objective of increasing production, lessening production cost, or otherwise bettering the welfare of farm families.

WAR ON WEEDS

BY A. T. SEMPLE

IN SELECTING and establishing good grazing for our cattle and other stock, we look for the most palatable plants that will produce abundantly throughout the growing season in spite of changing weather conditions and steady pressure by grazing animals. To whatever extent weeds are allowed to grow, just that far do we fall short of our objective to have a pasture produce what it ought to produce. Weeds rob the forage plants of plant food and moisture. The taller weeds shade out some of our most desirable forage plants, such as white clover and Bermuda grass.

Weeds, being generally unpalatable, are avoided by the stock, so that much of the forage that may be growing with the weeds is wasted. On the other hand, in spots where the weeds do not interfere with grazing, the forage plants are likely to be so badly overgrazed that they fail to produce seed or maintain a vigorous growth. Thus, weeds promote patchy grazing with the result that production is reduced and forage is wasted. Meanwhile, the weeds flourish and produce seeds by the millions.

According to actual count, bitterweed produces as many as 3,000 seeds per plant; mayweed, 2,000; bull thistle, 10,000; daisy fleabane, 22,000; and curled leaf dock 10,000 seeds. Is it any wonder that weeds “take” a pasture?

In Mississippi, one part of a pasture was mowed and another part was unmowed for three successive years. Clippings were made on both parts at fre-

quent intervals to duplicate grazing as nearly as possible. Some areas were protected from grazing for short periods. Differences in yield between these protected plots and similar grazed plots clipped at the same time gave a measure of what plants and how much the cattle actually had eaten.

In the unmowed part, $2\frac{1}{2}$ times as much feed was left uneaten as in the mowed part. In other words, on the mowed part of the pasture, the cattle ate 80 percent of the plant growth. On the unmowed part, they ate only 50 percent of the growth. However, the total production of grass was approximately the same in both plots.

Since mowing a pasture increases the feed supply by 50 percent, what farm operation pays any better? With weedy pastures so prevalent, we must think of mowing as an important contribution to our war goals for greater meat and milk production. Pastures and range supply half the feed for all of our livestock. Even a 25-percent increase in the feed supplied by grazing would mean a net increase of about $12\frac{1}{2}$ percent in the total quantity of meat and milk and other livestock products.

There is, however, even more advantage to be gained from mowing pastures, for this practice also affects the quality of the herbage to be grazed. On the mowed pastures in Mississippi, the herbage contained an average of nearly 12 percent protein (11.76) throughout the season. On the unmowed pasture, the herbage averaged a little less than 7 percent (6.92) protein. The difference in protein resulting from mowing was 172 pounds. This is equivalent to that contained in 422 pounds of 41-per-

ent cottonseed meal. At \$40 per ton, it would cost \$8.44 to make up the deficiency of protein in each acre of unmowed pasture. It looks as if mowing pastures may be one of the most profitable things a farmer can do. Is it too good to be true? Ask the farmer who mows regularly. B. C. Balch of Conway County, Ark., who has been building pastures for 33 years on worn-out cotton land, mows regularly twice a year and has some of the best pastures in the United States.

Chemical analyses of grasses at various stages of maturity have shown the value of clipping in increasing the nutritive value of the grass. Dallis grass clipped in the seeding stage analyzed 6.9 percent protein; 2 weeks later new growth from the same area contained 18.7 percent of protein. Bermuda clipped in the seeding stage contained 7.1 percent protein. Such grass is very unpalatable. Two weeks later, the new growth contained 19.1 percent of protein. Such feed is highly palatable and nutritious.

At least a word or two of caution is necessary in all farm operations. To be effective in weed control, the mowing must be timed to catch the most objectionable weeds—when they are nearly mature, but before the seeds are well formed. If the mowing is done when the weeds are beginning to bloom—the time at which food reserves in the plant roots are near the lowest point—the whole plant is most likely to be killed. In the case of some plants such as bitterweed and mayweed, mowing should be done when blossom forming starts, rather than when flowering begins, because at that stage, viable seeds have been formed.

Many farmers do not want to destroy nests of pheasants, bobwhite, and other useful birds that frequently raise their broods in the grassy cover of well-managed pastures. If the first mowing of the season is delayed until the young birds have hatched—and in most places this occurs before the weeds have seeded—the pasture can produce better grass and game birds too. Some farmers who want to mow early use a flushing bar which flushes the setting bird from the nest and warns the driver to pick up the mower blade in time to skip the clutch of eggs.

Many perennial weeds must be mowed for 2 or 3 years to be certain that the roots are killed. Continuous cutting of the top growth exhausts the strength of the roots until they die.

More details on the experiment in mowing weeds and much additional information on making pastures more productive is to be found in Mississippi Experiment Station Bulletin 356, "Pastures in Mississippi," by H. W. Bennett.

DUTCH IMMIGRANT

(Continued from page 221)

idly recovering his health in New Mexico's pleasant climate and nothing now seems too difficult for him.

Again hearkening back to his days in Holland, he drew a striking parallel.

"Soil erosion in this country," he said, "is like the ever-present danger of the sea in Holland. Both dangers may be disregarded until it's too late.

"Sometimes, back in Holland, farmers postponed necessary repairs to their dikes. For years, everything seemed all right, but suddenly the dike would break, flooding thousands of acres with salt water, drowning people and cattle, and destroying crops and houses.

"Some American farmers seem to be equally shortsighted. They overlook—or don't want to see—the gradual wastage of soil. They may raise fairly good crops for a long time, but inevitably there comes a day of reckoning—and the land may be ruined.

"'To have and to hold.' That's a saying with deeper meaning than certain careless and irresponsible landowners are willing to understand."

So saying, Henry Folmer turned and looked speculatively at his fields and his pasture land. The determined set of his jaw, the meditative gleam in his eye—these spoke eloquently of the pride and the ambition of an immigrant who had found freedom in a new land.

PASTURES STOP EARLY TAKE-OUT

IN 1935, Dr. T. B. Hutcheson, of Virginia Polytechnic Institute, made the following statement regarding some of the best pasture sections in the United States that were famous around 1900 for production of high grade beef for export: "The trouble in southwest Virginia is that pastures don't come out until 2 weeks later than they used to; they 'take out' 2 weeks earlier in the fall; and when they are growing they don't support the cattle they used to." At that time only 5 percent of the pasture had received applications of phosphate.

A recent survey by VPI shows that since 1935 pastures on over 70 percent of the farms in nine southwest Virginia counties have been phosphated. Pastures in the area are now greener; they last longer and carry more cattle.

The report of J. H. Box, who operates a TVA test-demonstration farm in Smyth County, shows what an individual farmer can do. In 1934, he was cultivating 88 acres. In 1935 he began following a

AFRICAN ASSIGNMENT

regular rotation of crops and reduced his cultivation to 39 acres. By building up fertility, principally with lime, phosphate and legumes, Mr. Box increased his crop yields by 75 percent. With phosphate and good management, he restored his pastures and doubled the number of cattle the farm would support. The increased farm income enabled his married son to return to the farm. They have modernized two houses, built a new barn, and repaired the old one.

On a group of 46 such farms, in southwest Virginia, average receipts (gross income) increased steadily from \$2,989 in 1934 to \$3,574 in 1939. Since these figures are adjusted for changes in prices, they represent a 20-percent increase in production. The products are chiefly beef, dairy products, sheep, hogs, and poultry.—A. T. Semple. (The information is based on a speech by David E. Lilienthal, Chairman, Tennessee Valley Authority, at Abingdon, Va., April 11, 1942.)

GIVE GOOD GRASSES A CHANCE TO GROW

On a Brown County, Tex., farm of 300 acres, Amos Porter has doubled the carrying capacity of his pasture by good management. When he began operating this farm 3 years ago, the pasture was grown up to brush and coarse grasses. He brought the brush under control by putting on 5 goats for each cow and grazed the coarse grasses heavily in the spring while they were palatable. Then he moved the cattle to oat stubble fields containing Johnson grass for summer grazing. This gave the desirable grasses an opportunity to reseed and become better established.

GREEN FEED IN STALK FIELDS

Joe Kohl's cows, near New England, S. Dak., graze contour buffer strips of crested wheat which are used in the contour cultivation of his corn. He says his "cows walk right through the standing corn fodder in the fall to get at the green crested wheat grass . . . and when they feed on crested wheat grass, milk production rises appreciably." This use of grass along with contour cultivation on the steeper land also increases grain yields, and provides good crops of hay and seed. Mr. Kohl is convinced that it makes his machinery last longer with fewer break-downs and repairs. With more water going into the soil for crop production, there is less rilling and gullying. Hence, the ground is smooth, there is less jolting, tractors require less fuel, and horses can cover more ground in a day.

THE LINE in the song from the first World War that went "though the boys are far away they dream of home" seems to hold good for World War 2. If they used to be Soil Conservation Service workers, they are still thinking in soil conservation terms—so it appears from a letter from one of our former men now in North Africa.

First Lt. John N. Davis has written to his old "boss" of the Spartanburg, S. C., project days, who is now chief of the Regional Records and Reports Division at Spartanburg, relating, among other things, that he has run across a soil conservation project in North Africa.

"*Defense et Restoration du Sols* was written in huge letters across the hillside," Lieutenant Davis wrote, "and although I was quite a distance away the hillside had the appearance of having been benched for the purpose of conserving water. As you know water is a scarce article over here. I'm very proficient as a quart bather, you should see me!"

"If I only had one of the 35 mm. cameras and some film, I could really take some pictures that would be of invaluable assistance when I get back to the job," he continues. "I have seen slopes, in cultivation, so steep that it is impossible to stand on them. I've seen erosion rampant and unchecked. I've seen the most modern farms and farming methods, including machinery, and 20 miles away I've seen the most primitive sort of farming and farming tools."

The letter from Lieutenant Davis acknowledges receipt on Christmas Eve of a news letter which Mr. Jeffords mimeographs as an extracurricula activity and sends to all former SCS men from South Carolina and the regional office in the armed services. In addition to being editor of the news letter, Mr. Jeffords is also a pipe collector and recently he has been getting pipes from SCS men in all parts of the world.

"I'll make an effort to get you a North African pipe when I can," Lieutenant Davis writes. "At present, none seems to be available, but I'm on the lookout."

Prior to joining the armed forces, Lieutenant Davis was work unit conservationist in the Lower Saluda Soil Conservation District in South Carolina.—B. K.

Sloan Lightcap, Marion Center, Pa., estimates a one-third saving in power and labor with strip farming and says there is a considerable saving in wear and tear on machinery. He can use two horses and handle a grain binder on the strips as easily as with three horses previously.



BOOK REVIEWS AND ABSTRACTS

by Phoebe O'Neill Faris

TRIP CROPPING FOR WAR PRODUCTION. By Harold E. Tower and Harry H. Gardner, *Farmers' Bulletin No. 1919. January 1943.*

Farmers and field men of the Soil Conservation Service and other agricultural agencies have been working diligently for several years to perfect strip-cropping methods for different regions of our country. This publication describes the four general types of strip cropping now being widely used especially on the two and a quarter million farms within soil conservation districts. Mr. Tower and Mr. Gardner have given the subject thorough treatment. The result is that we now have available a practical and complete treatment of the strip system of cropping, including field arrangement, rotations, contour cultivation, soil fertility management, grassed waterways and field borders.

The strip-cropping system of farming is especially important in preventing water and wind erosion and conserving soil moisture, but it also has proved very effective in increasing crop yields. The latter half of the bulletin gives recommendations for adapting strip cropping to the several regions of the United States—the Northeastern and North Central States, the Southwestern and West Gulf region, the Great Plains, and the far West.

MORE FOOD THROUGH CONSERVATION FARMING. By Arthur T. Semple, United States Department of Agriculture *Farmers' Bulletin 1909. September 1942.*

There can be no doubt whatever now that conservation farming guarantees greater yield for war emergency needs and continuing balanced production after the emergency is over. Bulletins such as this one, written especially for farmers, are important contributions to the long pull ahead in meeting demands for the food, fiber, and oil crops that we must produce on our own soils and in great quantities for some years to come. The farmer can use this publication as he would use any other tool because it is packed full of practical helps that will be of value throughout planting, growing, and harvesting seasons and in planning for another year.

Since this is a wartime bulletin the author has held closely to the wartime objective—to produce on the farms of our country maximum amounts of the crops needed to help win the war, and to do this without injuring the land. For this reason, each phase of farming is discussed briefly and simply to point out conservation methods most easily and quickly applied—things to do to prevent waste of power, fuel, labor, machinery, water and feed, and above all, the land.

How and where to increase crops; what to do with sloping land; how to make wet land more productive; the part of woodland in the war; cattle numbers as related to pasture, range and feed; cover crops to offset nitrogen shortages; economical use of fertilizers, manure and stalks and stubble—these are but a few of the emergency problems handled in the 54-page bulletin. Specific wartime crops are

treated in more detail than others not needed urgently during the present crisis; but it might be said that Mr. Semple's bulletin is most valuable for its great number and variety of "tip-offs" to the farmers of the country, in every climatic region, on things to do on their own farms to attain better yields through greater efficiency in handling crops and the land. More than 50 excellent photographs, taken on probably as many farms in different parts of the country, are included to point out methods and reasons for using them to increase yields.

"More Food Through Conservation Farming" is a co-operative work: different divisions of the Soil Conservation Service supplied most of the information, but important parts of the text were also supplied by Bureau of Plant Industry, Agricultural Adjustment, Extension Service, Animal Industry, and Animal Husbandry.

STUBBLE-MULCH FARMING FOR SOIL DEFENSE. By L. S. Carter, *Farmers' Bulletin No. 1917. December 1942.*

Because, this war, we want to go warily to avoid the disastrous aftermaths of the plow-up orgy of last war, we are determined to use farming practices that will give some assurance of soil security. Mulching is one of these practices. This bulletin is not merely a reminder, or a discussion of stubble-mulching; it is compact and brief, but it tells the how and the why and the where of this simple but effective method that can be fitted so easily into the farming plan to utilize soil and moisture to best advantage and to keep down weeds and crop pests.

Specific directions are given to point out the materials to be used for mulching and the important steps in the operation on the land; how to plan rotations with mulching in mind; and ways of adjusting or modifying almost any kind of implement for best results in cultivating straw, stalk or stubble mulched fields. About 30 photographs are included so that the farmer may actually see what is meant by efficient use of crop residues on his farm and what he can accomplish by shifting implement parts to suit the job at hand.

STRATIFIED FLOW IN RESERVOIRS AND ITS USE IN PREVENTION OF SILTING. By Hugh Stevens Bell, *Miscellaneous Publication No. 491. September 1942.*

The Chief of our Service has written a Foreword to this publication to point out the importance of keeping the reservoirs of the country in good condition at all times and particularly during the period of wartime production so that water may be conserved and utilized in growing the food crops essential to the welfare of the Nation. The text of the bulletin constitutes a description of the movements of sediments and debris in lakes and reservoirs according to natural laws as discovered in studies made by the Sedimentation Division of the Soil Conservation Service in cooperation with the staff of the United States Bureau of Reclamation at Boulder City, Nev.

The object of the studies was to discover ways of utilizing the power, the direction and the velocities of density-current flow, in reservoir construction and operation, to minimize loss of capacity and to maximize the useful life of these costly structures. By means of properly placed outlets it is thought that a large percentage of the sediment that finds its way into water-impounding lakes and reservoirs can be carried beyond dams through use of stratified flow.

Between 40 and 50 unusually fine photographs are shown to point out the action of turbid underflow and muddy water discharges. The author has made this relatively new subject interesting by using an easy, readable style of writing and everyday examples—the tumbler of iced coffee, the “giant griddle upon which batter has been freshly poured,” the dust cloud and the fog bank—to illustrate stratified movements under water and on top of water in impounding lakes and reservoirs. The glass-walled laboratory reservoir, which reveals the most hidden secrets of density currents, was used and is still being used in studies of stratified flow, and some of the finest of the photographs taken through the glass walls are included in this publication. These photographs are sufficient proof of the importance of intensive explorations of this kind in the interests of conservation and utilization of rainfall.

DAY LENGTH AND CROP YIELDS. By M. W. Parker and H. A. Borthwick. United States Department of Agriculture *Miscellaneous Publication No. 507.* September 1942.

This is a brief report of recent findings by Bureau of Plant Industry scientists on the effect of length of daylight periods upon crop plants. Different varieties of such important wartime crops as soybeans, hemp and sugar beets were shown to have wide-range growth reactions to day lengths.

Choice of variety according to climatic conditions with special reference to length of light and dark periods was found to be an important factor in soybeans. This urgently needed wartime crop is being grown now in both the Northern and Southern States, in some instances solely for seed for use in making oil, food products and plastics, and in others for forage. It is thought that increasing acreages of soybeans can be grown successfully and economically over wider areas by careful selection of variety with regard to intended use of the crop and the daylight needs of the plant itself.

Tests with sugar beets have been most successful, especially in selection of localities best suited to excellent yields of seed. As a result of experiments with day lengths and temperatures, we now produce in the United States sufficient sugar-beet seed for our own use; whereas only a few years ago we imported from Europe almost all the sugar-beet seed we used to produce the crop.

CLASSIFYING LAND FOR CONSERVATION FARMING. By R. D. Hockensmith and J. G. Steele, United States Department of Agriculture *Farmers' Bulletin No. 1853.*

The man who owns a farm, or works somebody else's farm, or wants to buy a farm, needs to know, first and last, what his particular piece of land is capable of doing for him. Hit-or-miss farming doesn't pay any more in the United

States because, whether we like it or not, “already two thirds of the farms and ranches have been damaged to some extent by soil erosion.” It is for this reason that, for a decade now, men of the Soil Conservation Service have been surveying farm land all over the country, often farm by farm and field by field, to determine where crops can or cannot be grown successfully with safety to the soil; where soil-saving and soil-improving practices are needed; where production can be increased while at the same time the soil is improved rather than depleted; where trees are needed, permanent grass—many other facts that when used in planning will bring about better land use, more efficient farming, more food and fiber, more farmer income, without waste of our soils. At this date, 500,000,000 acres have been surveyed—150,000,000 acres for detailed farm plans and the remainder to determine general conditions applicable to type-of-farming planning.

This bulletin is the first “popular” presentation of the land-capability survey methods used by our Soil Conservation Surveys Division, and it is to be hoped that it will have wide distribution among farmers. It tells, in “everyday” language what the soil surveyor does when he goes into the field armed with soil auger, sighting instrument, map and sketching materials. It also tells why he is in that field and what he is looking for, and how the information he is gathering will be used to the advantage of the land and the people who own it, work it, or contemplate working it in the future.

The eight land-capability classes are shown in outline form and each is explained clearly and simply. In fact, it looks as though the farmer himself, with this new bulletin as his guide, might be able to determine to some extent the degree of past erosion and the present erodibility of his land, the use to which it should be put with or without conservation practices, and its restrictions and limitations—in short, what he can expect from his land and his labor if he does or does not treat his fields according to their capabilities. It might be a good idea, upon second thought, for neighboring farmers to look at one another's fields—a gully on another man's land is more easily recognized as a gully!

To show how the land-classification survey information is used, the authors describe in detail a conservation plan made for an actual farm of 151 acres located in Abbeville County, S. C.

It is expected that this bulletin will prove useful immediately, since it is compiled, both text and illustrative material, to meet wartime production needs. County war boards are to be supplied with copies, and parts of the text are to be used in the training courses for visiting Latin American students now in the United States for the express purpose of studying soil conservation methods and practices.

Mrs. Zeola Owen, who has 80 acres of timber on her farm near Springfield, Tenn., was able to buy \$2,000 worth of war bonds with the income she got from the sale of mature and over-mature trees from 44 acres of this woodland. At the same time she improved the stand of timber.

Mrs. Owen was the first cooperator of the cooperative farm forestry project established in the Robertson County soil conservation district.

Selective cutting included 67,000 board feet of red and black oak sold at \$13 per thousand; 21,000 feet of white oak at \$3 per thousand; 8,000 feet of poplar at \$60 per thousand. Thirteen black walnut trees yielded gunstock material at \$80 per thousand.

For REFERENCE

Compiled by **ETTA G. ROGERS**, Publications Unit



Field offices should submit requests on Form SCS-37, in accordance with the instructions on the reverse side of the form. Others should address the office of issue.

SOIL CONSERVATION SERVICE

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¹ From Superintendent of Documents, U. S. Government Printing Office, Washington, D. C.



That looks like a grassed waterway—that gap up yonder between those two dark bands of fresh-plowed earth. Turn the picture 90 degrees clockwise, and you have a rather perfect “V” for Victory.”

Levi Cuttebo, Iowa farmer, here plows out a contour strip in preparation for small grain. Strips above and below will be in corn and beans. Mr. Cuttebo knows how important are contour plowing and grassed waterways, among the many conservation measures calculated to boost crop yields.

American ingenuity and enterprise and patriotism ride up there behind the tractor wheel, helping to solve the terribly urgent problem of how to get the highest possible production in the face of almost—but not quite—insuperable difficulties.

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WELLINGTON BRINK
EDITOR

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SOIL CONSERVATION

CLAUDE R. WICKARD
SECRETARY OF AGRICULTURE

HUGH H. BENNETT
CHIEF, SOIL CONSERVATION SERVICE



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ACRES ARE ACES

BY HUGH HAMMOND BENNETT

WHOLLY UNDRAMATIZED and obscured behind the spectacular military phases of the war are 4 billion acres of vitally important land—some rich, some fair and some poor, but all valuable . . . Twenty-five million acres in Australia, some 69,000,000 in Argentina, about 460,000,000 in Canada and the United States, 550,000,000 in Russia, and many other large and small areas in many continents and countries around the globe—these are the world's food-producing regions. A richer prize, by far, than the oil lands of the Caucasus, the iron deposits of the Urals and the gold veins of South Africa, they are the most important of man's earthly possessions.

. . . On this land, more than 2,000,000,000 people must depend for their food and clothing. Millions of these people have never had enough to eat. As the good land shrinks in area—and it is shrinking—their chances of ever getting enough to eat and wear are shrinking too. And not all of this . . . is good land by any means. Millions of acres have been virtually exhausted by centuries of continuous cultivation and erosion. Other millions have been damaged in varying degrees. The balance which has not been damaged and is not subject to erosion by wind and water is pitifully small—far less than the minimum of two and a half acres per capita now required to produce what we in America consider an adequate diet.

. . . The use to which the world's croplands are put after the war will decide in great meas-

ure what kind of peace we shall have. Under Axis domination, these lands would be used to feed and rebuild Germany and Japan, and perhaps Italy, at the expense of all others. Under United Nations inspiration, they would be used to support, in the words of Vice President Wallace, "a better standard of living for the common man, not merely in the United States and England but also in India, Russia, China and Latin America; not merely in the United Nations but also in Germany and Italy and Japan." . . .

Food, of course, is the first requisite for civilians and fighting men, but there are many other ways in which our farm lands contribute to arming our fighters. Glycerin, made from soybean oil, is used in firing shells. The oil of the castor bean is used as a binder for incendiary bombs. Cotton is used in parachute cloth and for airplane coverings, and cotton linters are soaked in nitric acid to make smokeless powder. There is as much wool in the mount of an 81-mm. mortar as in a woman's all-wool skirt. Sugar and corn yield the alcohol used in making smokeless powder. Peanuts contribute to the making of depth charges to blow enemy submarines out of the oceans . . .

The list of countries on the Axis side of the cropland balance sheet is long and impressive . . . With generous cropland allotment, the Axis total comes to an estimated 656,753,000 acres.

The list of croplands available to the United Nations is far more impressive—the U. S. S. R., England, Wales, Scotland, Northern Ireland,

(Continued on page 248)

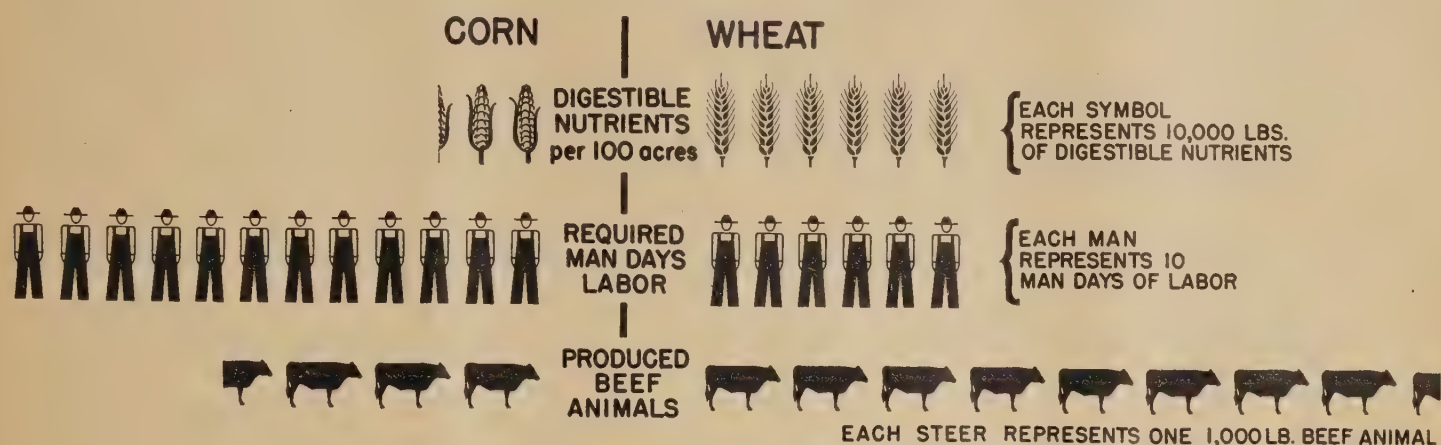
EDITOR'S NOTE.—These excerpts from a much longer article by the Chief of the Soil Conservation Service are reprinted by special permission of The Saturday Evening Post, copyright 1943, by the Curtis Publishing Co.

MORE MEAT with LESS LABOR by R.E. Uhland



COMPARATIVE RETURNS FROM CORN AND WHEAT IN NEBRASKA

AVERAGE OF FIVE COUNTIES 112 to 138 MILES WEST OF THE IOWA LINE, 1934 to 1938



LABOR AND PRODUCTIVE LAND are solid bulwarks to the fighting democracies. Much depends upon the wisdom and efficiency with which we distribute our manpower and put to war work every cultivated acre. It will be shown in this article how in certain areas a shift in crops can work wonders in increasing the production of digestible nutrients, in effecting better conservation of the soil, and in reducing the amount of labor required.

DIGESTIBLE NUTRIENTS PER BUSHEL (OR ACRE)

Production records of the principal Corn Belt States—particularly Indiana, Illinois, and Iowa—show that larger returns of digestible nutrients *per acre* and *per man hour* are obtained by growing corn rather than wheat. From 1934 to 1941 an average of 1,656 pounds of digestible nutrients was produced for each acre of corn harvested, while in the same period wheat returned only 887 pounds of digestible nutrients per acre. A bushel of corn and a bushel of wheat, according to Morrison's "Feeds and Feeding," contain an average of 45.1 pounds

and 51.2 pounds of digestible nutrients, respectively. Wheat contains more protein than corn. Therefore, when wheat is the basic concentrate in the feeding ration, less protein supplement is required to secure a proper balance.

DIGESTIBLE NUTRIENTS PER MAN HOUR

The returns for each man hour spent in growing corn were 89.5 pounds of digestible nutrients, as compared with 75.8 pounds from the same labor expended in growing wheat. The labor and equipment, however, used in growing wheat do not compete directly with the labor and equipment used in producing corn. In addition to supplying valuable feed as grain, wheat serves as an excellent nurse crop for clover and grass in the rotation. It protects the land against erosion and insures larger yields of all succeeding crops. Winter wheat can usually be advantageously grazed in the spring, contributing a great deal toward the production of beef and dairy products. Therefore, in the Corn Belt, center of livestock production, wheat and corn can be grown profitably, although the latter *in this area* produces more digestible nutrients per unit area.

The accompanying chart contrasts the returns from 100 acres of corn and wheat in five Nebraska

EDITOR'S NOTE.—The author is principal soil conservationist, Office of Research, Soil Conservation Service, Washington, D. C.

THE PICTURES

1. Oats and lespedeza protect the land against erosion and supply excellent feed with little labor and equipment.
2. This wheat made 30 bushels per acre in 1941 with less than 6 man-hours labor per acre.
3. Leaving the stubble on the surface protects the land against erosion and runoff.
4. This type of land should be in wheat and clover, not corn.
5. Little labor is required while this breeding herd grazes on 500 acres of brome grass.

FRONT COVER OF THIS ISSUE: Hogs being fed ground wheat with a protein supplement.

counties. These counties represent the fifth north-south tier of counties lying 112 to 138 miles west of the Iowa line. The production of wheat and corn is based upon county census figures. The labor represents only the man days used in production and harvesting. Results of feeding trials conducted by numerous experiment stations were used in calculating the beef that might be produced from feeding the corn or wheat from 100 acres. In the discussion that follows, the results of replacing part of the corn acreage of Nebraska and Kansas are projected. The figures show the increased beef and pork that may be expected if 20 percent of the 1943 corn acreage goal were to be replaced by wheat and the increased grain yield were fed to cattle and hogs.

County and State records show that in Nebraska during the 5-year period 1934 to 1938, and in Kansas during the 8-year period 1934 to 1941, wheat consistently yielded more digestible nutrients per acre than did corn. Feed trials reported by numerous experiment stations show that wheat can be fed safely to both cattle and hogs. The gains are as good, pound for pound, as from corn. In fact, wheat of good quality has been shown to be slightly superior to corn when fed to swine. In 16 experiments, pigs fed ground wheat and tankage, or some other protein supplement, gained 1.39 pounds per head daily on the average. Others fed shelled corn in place of ground wheat gained 1.27 pounds. In these trials, 100 pounds of ground wheat was equal in value to 97.7 pounds of shelled corn plus 3.2 pounds of tankage or tankage equivalent. Wheat gave excellent results when fed as the only grain to pigs on pasture. It also showed up well when fed with a protein supplement to pigs in a dry lot.

Considering all the data available, it may be concluded that for beef cattle whole wheat (which is ground before feeding) is worth about as much per ton as a good grade of shelled corn. It may be fed as the only grain, or in combination with corn. In trials at Missouri, ground wheat combined with a protein supplement and legume hay produced the same gain with from 5 to 15 percent less grain than was the case with either corn or barley. Preliminary figures supplied by the Bureau of Agricultural Economics indicate that in Kansas an average of 11.9 man-hours is expended in producing an acre of corn as contrasted to 4.6 man-hours for producing an acre of wheat. In Nebraska the average labor required per acre of corn is 11.8 man-hours while for wheat it is 5.7 man-hours.

Not only does wheat possess merit as a feed, but experiments show that the erosion losses from land cropped to wheat are much less than from land cropped to corn.

The production rates of digestible nutrients per acre for corn and wheat for different tiers of counties in Kansas and Nebraska are shown in table 1.

TABLE 1.—*Digestible nutrients produced per acre of corn and wheat in Kansas and Nebraska. (Average 1934 to 1938 for north-south tiers of counties beginning at Iowa line and continuing west)*

North-South tiers of counties	Nebraska		Kansas	
	Corn	Wheat	Corn	Wheat
	Pounds	Pounds	Pounds	Pounds
First tier.....	726	914	523	678
Second tier.....	618	803	505	723
Third tier.....	433	763	451	703
Fourth tier.....	325	678	419	743
Fifth tier.....	235	587	338	723
Seventh tier.....	280	607	63	181

The yields for Nebraska are based upon acres harvested; those for Kansas are for acres sown. The Nebraska yields appear higher, but records on planted acres were lacking. The yields of digestible nutrients from wheat were much greater than from corn in both States. The production of corn decreased steadily from east to west; the decreases in wheat yields were much less marked.

CALCULATED GAINS

Table 2 projects what might be expected if 20 percent of the 1943 corn acreage goal for Nebraska were planted to wheat. Were such a change effected, the calculated saving in labor on 1,612,000 acres would be 983,319 man-days. Since wheat supplies more digestible nutrients per acre than corn, this projected increased production of wheat, if fed to beef cattle according to recommended feeding procedures, would result in 62,049,400 pounds of live beef. If fed to hogs it would produce 83,082,750 pounds of live pork.

TABLE 2.—*Saving in labor and increase in production of beef or pork for 1944 that would result from projected replacement with wheat of 20 percent of the 1943 corn acreage goal in Nebraska*

North-south tiers of counties west of Iowa line	Corn acres replaced by wheat	Labor saved, man days	Additional production of beef	Additional production of pork
		10-hours	1,000 lb.	1,000 lb.
0 to 25 miles.....	309,504	188,797	8,083	10,829
26 to 53 miles.....	338,520	206,497	8,704	11,655
54 to 80 miles.....	398,164	242,880	18,242	24,436
81 to 111 miles.....	243,412	148,481	11,939	15,965
112 to 138 miles.....	125,736	76,699	6,145	8,231
178 to 232 miles.....	196,664	119,965	8,935	11,967
0 to 380 miles.....	1,612,000	983,319	62,049	83,083

The data indicate the possibility of increasing food production, particularly beef and pork, by replacing some of the corn acreage with wheat in the 1944 crop year. These calculations are based upon county census figures for 1934 to 1938. The

suggested increased acreages of wheat for the six tiers of counties are based upon the average corn acreage actually harvested during this 5-year period.

As noted in table 2, a substantial saving in man days of labor can be expected. If half of the 983,319 man days are devoted to the production of beef and pork, the other half can be spent in producing additional wheat on acres selected for their capability. In other words, if suitable land is available, the remaining 491,660 man days can be used for the cultivation of 862,560 additional acres of wheat.

It is reasonable to assume that these additional acres, having been selected according to the capability of the land, would have at least as high productivity as the wheat land in cultivation during 1934 to 1938. Therefore, it is surely probable that the grain harvested would be sufficient to produce 90,424,600 pounds of live beef or 121,104,500 pounds of live pork. It is, of course, recognized that supplemental feed will have to be used with either wheat or corn. The grazing, however, supplied by wheat in early spring frequently contributes a great deal toward the production of beef and dairy products.

A general plowing up of pasture or range land should be discouraged, inasmuch as good pasture supplies the cheapest and most economical feed for cattle, sheep, and horses during the growing season—a period when farm labor is always at a premium. Even for swine, pasturage is an important means of reducing the cost of feeding. Studies reported on 478 Corn Belt beef farms showed the breeding cows obtained practically all their feed from pasture 200 days of the year. Although pasture furnished a little more than one-half the total feed for the year, the cost of pasture was only one-third of the annual feed bill. Better yet, this pasture land enjoyed excellent protection against erosion and loss of fertility and required a minimum of labor.

Table 3 shows the estimated saving of labor, and the expected increase of beef or pork, that would result in 1944, were wheat grown in preference to corn on 20 percent of the 1943 corn-acreage goal in Kansas. The wheat acreage for the six north-south tiers of counties is distributed on the basis of the average corn acreage harvested there in the 5-year period 1934 to 1938. Since the corn acreage of Kansas is lower than that of Nebraska, the projected increase in wheat acreage is likewise less.

The calculated saving in labor from substituting for corn 722,025 additional acres of wheat is 527,078 man days. The *increase* in digestible nutrients from the added acreage of wheat, if used for feed, would result in 21,949,200 pounds of live beef or 29,420,900 pounds of live pork.

TABLE 3.—*Saving in labor and increases in production of beef or pork for 1944 that would result from projected replacement with wheat of 20 percent of the 1943 corn acreage goal in Kansas.*

North-south tier of counties west of Missouri line	Corn acres replaced by wheat	Labor saved, man days	Additional production of beef	Additional production of pork.
		10 hours	1,000 lbs.	1,000 lbs.
0 to 25 miles.....	157,402	114,903	2,370	3,179
26 to 53 miles.....	132,853	96,983	3,166	4,240
54 to 75 miles.....	145,127	105,943	2,438	3,266
76 to 105 miles.....	124,910	91,184	8,560	11,463
106 to 140 miles.....	98,917	72,209	4,420	5,199
271 to 301 miles.....	62,816	45,856	995	1,354
0 to 301 miles.....	722,025	527,078	21,949	29,426

If one-half the labor saved were spent in producing beef and pork and the other half used to produce more wheat, an additional 572,504 acres of wheat could be grown on well-selected land. On the basis of the relative distribution shown above, the digestible nutrients resulting from this added acreage of wheat would be sufficient to produce 52,914,200 pounds of live beef or 70,867,300 pounds of live pork.

The foregoing calculations indicate that replacing corn with wheat in a portion of the corn acreages in Nebraska and Kansas would result in a considerable saving of labor. At the same time, the digestible nutrients in the wheat produced on these acres would exceed those expected from an equal acreage of corn. Specifically, if 20 percent of the 1943 corn acreage goals for these two States were allotted to the growing of wheat, enough man hours of labor would be saved to permit the additional production of 228,337,400 pounds of live beef or 304,475,450 pounds of live pork.

SPRING WHEAT IN THE DAKOTAS

This year many farmers in the Dakotas are making a larger contribution to our food program by having increased their spring wheat acreage. According to State statistics, the average calculated return of digestible nutrients from land in corn for the 10-year period 1929 to 1938 was 617.9 pounds per acre in North Dakota and 527.7 pounds in South Dakota. One man hour of labor spent growing corn in North Dakota produced an average of 49.0 pounds of digestible nutrients as compared with a return of 61.8 pounds for spring wheat. In South Dakota the yield of digestible nutrients for each man hour of labor was 40.6 pounds for corn and 73.2 pounds for wheat. The average return of digestible nutrients from labor spent in producing spring wheat was 26.1 percent greater than for corn in North Dakota, and 80.3 percent greater in South Dakota. The yield of wheat for North Dakota was 401.6 pounds of digestible nutrients per acre and for South Dakota the yield was 431.7 pounds.

These yields are based upon harvested acres of both corn and wheat. Records for 32 counties in eastern South Dakota for the period 1937 to 1941 show that only 79.9 percent of the corn acreage that was planted in North Dakota was actually harvested, while 90.5 percent of the spring wheat sown was harvested. The average corn yield from planted acres was 1.5 bushels less than from harvested acres, while the yield of wheat from planted acres was only 0.68 bushels less than from harvested acres. These data indicate a higher abandonment or failure to harvest corn than wheat during this period of good crop years in South Dakota. Records also show a much higher abandonment of corn than wheat in the winter wheat areas, particularly during drought years.

Obviously, during the present emergency farmers in these States who are short of labor and have equipment for growing wheat have a better chance of producing more digestible nutrients as well as more beef and pork by seeding spring wheat on at least part of their corn land each spring.

CROPPING GOVERNED BY LAND, LABOR, AND EQUIPMENT

These findings from four States (Kansas, Nebraska, South Dakota, and North Dakota) show that replacing corn with wheat on a part of the land commonly devoted to corn will save labor and supply feed for the expansion of our livestock products. This applies particularly to the States bordering the western side of the Corn Belt.

There is also a conservation angle to be considered. Land cropped to wheat is much less subject to erosion than land cropped to corn. Wheat can be combined with soil-building crops such as clover, lespedeza, and brome grass, especially in those areas of highest rainfall. The latter crops furnish added protection to the soil against erosion. Increased yields of succeeding crops of corn and wheat will be obtained and pasture or hay for added livestock production will result.

The past 6 years have been exceptionally good ones, and production of nearly all important crops has been generally high. It is important, especially during the present emergency, that practical steps be taken to safeguard against the low production which may be associated with years of very light rainfall. The data offered here indicate that farmers in those States bordering the Corn Belt on the west can help to ensure the country against low food supplies by growing wheat on part of their present corn land. The labor saved by replacing corn with wheat can well be devoted to the production of livestock or livestock products.

Farmers in each community now will want to make a very careful study of their farming problems, and plan their cropping for 1944. They should take into account the available land, labor, and equipment and the possibility of producing livestock. Obviously, farmers in different sections of these bordering States will need to pay sharp attention to proper land use and cultural operations, as the advantage of wheat over corn varies according to soil and climate. In those sections where rainfall is frequently low, sorghums supply more forage and grain than corn. Throughout the central and southern parts of the Western Plains States, for instance, stockmen depend largely on sorghums for their winter feed.

ACRES ARE ACES

(Continued from page 243)

Free China, the United States, Canada, Mexico, India, Syria and Lebanon, Egypt, Libya, Algeria, French Morocco, the Union of South Africa, Australia and New Zealand. As this is written, the fate of Tunisia, with her considerable bit of cropland, still hangs in the balance.

The total estimated cropland that the United Nations own or control in these countries is 1,356,218,000 acres. And to that we can add a substantial area in other countries of the United Nations family—Guatemala, Honduras, Costa Rica, El Salvador, the Dominican Republic, Haiti, Ethiopia, Nicaragua, Panama, Cuba, and some small colonial territories of several of the United Nations.

Finally, on top of all that, we can count the 23,000,000 acres of cropland in Brazil, which is participating in the war against the Axis . . .

Nor is that all. There are vast areas of land that are potentially suitable for agriculture in several of the United Nations, awaiting only development. In the United States, for instance, there are several areas of potential cropland, and a conservative estimate places the figure at about 30,000,000 acres. In the U. S. S. R. there are undetermined millions. In Brazil, with her great Amazon valley, there are other potential millions of acres which many authorities believe may be profitably developed for agriculture. And elsewhere, of course, there are other smaller areas . . .

(Continued on page 261)

SEED for CONSERVATION PRODUCTION

by C.R. Enlow



1



2



3



4

1. In Montana a stand of crested wheatgrass yields to the advance of a binder. 2. Kansas, where ingenuity is the rule rather than the exception, finds these new-type strippers doing an efficient job collecting the seed of sideoats grama, useful in the development of erosion-resistant pastures; the strippers are mounted on old automobile chassis. 3. And here is a glimpse of another pasture in the Sunflower State—a mixture of weeping lovegrass, sand lovegrass, little bluestem, sandhill bluestem, sideoats grama, blue grama, gallata, sand dropseed; it was seeded on former blow land in Morton County. 4. Combining seed in a big bluestem meadow; a good yield resulted, of both seed and hay.

ONE OF OUR TOUGHEST PROBLEMS of 1943 and subsequent years is to supply the need for seed of grasses and legumes. Expanded acreages of war crops—soybeans, peanuts, field beans, flax, corn, potatoes, and other items—have come to some extent at the expense of hay and pasture. Yet, hay and pasture are particularly vital to the increased production of livestock and livestock products. These

same meadows and pastures are also the source of much of our seed supplies, and the demand for feed makes it particularly difficult to pass up a hay crop or withhold a pasture from grazing long enough to produce a seed crop.

The production in 1942 of seed of such staple legumes as alfalfa, red clover, alsike clover, and sweetclover, dropped materially below that of 1941 and it is estimated that the amount of seed on hand is entirely inadequate to meet the demands for 1943.

EDITOR'S NOTE.—The author is chief, Agronomy Division, Soil Conservation Service, Washington, D. C.

Barely half enough red clover seed is in sight, approximately 60 percent of the alfalfa and alsike clover, and about 70 percent of the needed sweet-clover. Seed of other grasses and legumes is short and it will be very difficult for farmers to harvest ample quantities of seed when they already have a tremendous food production program to keep them busy.

UNUSUAL DEMANDS FOR SEED

If it is expected that the yields of the needed food and feed crops are to be maintained, it is essential that crop rotations be followed. The high yields of the war crops that have been obtained have resulted largely because these crops have been rotated with grasses and legumes. A shortage of seed of grasses and legumes and the pressing need for increased acreages of other crops at this time may make it necessary to shorten rotations beyond the safety point for conserving the soil, but increased acreages to get more production of war crops will do no good unless we can keep up acre yields. There is no substitute for grasses and legumes for this purpose.

In addition to the need of grass and legume seed for crop rotation work, it is particularly important that all possible acreages be planted to supplemental pasture crops of sudan grass, sweetclover, lespedeza, rape, millet, and other crops as insurance for continued livestock production, should drought seriously affect the production of the already reduced acreage of perennial pastures. Ample feed is essential to maintain milk production and livestock gains, and it would be tragic if feed supplies should run low because of lack of seed to plant the crops. Protein feeds for livestock are scarce right now, and supplemental pastures will help materially to overcome the shortage.

Green manure crops are also particularly valuable at this time as a source of nitrogen for crop production because of the heavy drain on the supply of nitrogen for fertilizer, munitions, and other war needs. Cover crops to prevent erosion, leaching, and to maintain production of orchards, vineyards and field crops, are particularly important. Further, there are still large areas of formerly cultivated land in the Great Plains and other sections of the country that are now bare or producing nothing but weeds, that should be revegetated immediately in order to furnish much needed livestock feed. Seed is the first essential to get green manure and cover crops and to accomplish revegetation.

The armed forces have, during the past two years, developed hundreds of cantonments, airfields, ordnance plants, forts, and other types of units that

add up to a tremendous acreage. In the construction program, it has been necessary to destroy vegetation that must be reestablished to prevent wind and water erosion and to facilitate military action. Millions of pounds, principally of grass seed, will be required to revegetate these areas. The scarcity of grass seed adapted to the seeding of airfields and other units of the armed forces is evidenced by the fact that a short time ago it was necessary to remove from the market all the carpet grass and Bermuda grass seed in the country in an attempt to acquire a sufficient quantity for the Army and Navy.

Under lend-lease we are purchasing and shipping to England, Russia, and several other allies, millions of pounds of seeds of all kinds, from vegetables to grasses and alfalfa. This has made a heavy inroad on our seed supplies. Many kinds of seeds are now being exported that were being imported only two or three years ago.

It is not possible to estimate accurately in advance all of the needs for seed. For this reason it has been proposed that a stockpile for seeds of all kinds be developed to take care of any demands that may arise. To meet all the needs mentioned previously and at the same time develop a reserve stockpile is indeed a tremendous undertaking. During the war and undoubtedly for some time afterwards, there will be quite a demand from other countries for our seeds, and it seems logical that we should be prepared to meet such an emergency.

ACCOMPLISHMENTS TO DATE

The Department of Agriculture, a short time ago, officially recognized the grass and legume seed shortage by establishing floor prices for 20 of our legumes and grasses. These are Northern alfalfa, 30¢; Central alfalfa, 28¢; red clover, 25¢; biennial white sweetclover, 7¢; biennial yellow sweetclover, 6¢; biennial mixed sweetclover, 5¢; alsike clover, 22¢; timothy, 4½¢; smooth brome grass, 11¢; orchard grass, 18¢; crested wheatgrass, 10¢; blue grama, 10¢; side oats grama, 10¢; buffalo grass, 50¢; Bermuda grass, 20¢; dallis grass, 20¢; bahia grass, 20¢; meadow fescue, 10¢; slender wheatgrass, 10¢; western wheatgrass, 8¢; and ladino clover, 65¢ per pound on the basis of clean seed. The price support is in the form of a loan that may be obtained on the seed in case the market price is low. It is hoped that other seeds may be given supporting prices as the need may arise. Farmers will undoubtedly be more willing to harvest seeds when they have assurance of a definite price with a chance of getting a higher price per pound of seed.

The Agricultural Adjustment Agency has for some time been contracting for the production of

cover-crop seeds in order to get increased supplies for more widespread use in the Southern States. This has resulted in a tremendous expansion of the acreage and production of vetches, Austrian winter peas, and crimson clover. Due to the very wet season in the Pacific Northwest last fall, however, it was impossible to make extensive seedings. As a result, the outlook for a good seed-production program of the vetches and Austrian winter peas for 1943 is not bright at this time. Plans are under way for a purchase program of several legumes, seed of which is produced in the Southern States, and this should materially aid in increased production.

Arrangements have been made by the Department, through vegetable seed processors and producers, to expand the production of vegetable seeds this year for both domestic and lend-lease purposes. This move has also hinged around supporting prices to farmers in order to get increased production. With the vegetable seeds, however, it is customary to contract for acreages and for that reason it is a much less difficult problem to get the desired quantity of seeds produced.

ADDITIONAL EFFORT NEEDED

In spite of all of the recognition of our needs and steps taken so far to encourage production, it is quite evident that it will be necessary, through the press, radio, and by group meetings and individual contacts, to encourage the farmers to produce more seed. Already there is serious competition for land by the various crops that are in demand and it is not likely that farmers will be particularly enthusiastic to go in for extensive seed production when they are already taxed to the limit to meet the acreage goals for other crops in face of both machinery and labor shortages. In addition, much of the seed of alfalfa, red and other clovers, and many of our grasses are harvested from regular hay fields and pastures. These hay fields and pastures are at a premium at this time because of the increased livestock and livestock products program. Seed cannot be procured without passing up the opportunity for grazing a pasture or cutting a hay crop and under present conditions farmers will be rather unwilling to pass up a possible income from hay or pasture in order to gamble on a seed crop. Seed production, even with good prices assured for seed, is generally a gamble because of the possibility of damage or destruction of the seed by insects, disease, hail storms, or by wet weather just at the time the seed should be harvested. Equipment for harvesting and processing seed is not too plentiful and will be exceedingly difficult to get at this time. In spite of all these handicaps, the seed somehow or

other must be produced and it can only be done by an intensive campaign. Seed is the basis of plant production. Without seed, we cannot expect to produce the bumper crops we need next year.

During the past few years there has been a widespread seed production program in soil conservation districts in many sections of the country where little or no seed has previously been produced. Throughout the South, millions of pounds of seed of legumes and grasses, including crimson clover, bur clover, crotalaria, annual and perennial lespedezas, blue lupine, Singletary peas, Austrian winter peas, hairy vetch, and several others, have been produced. In the Northeastern States, ladino clover, improved strains of red clover, timothy, brome grass, orchard grass, birdsfoot trefoil, and others, have been in demand and seed stocks are increasing. These and other grasses and legumes are also being produced in the Corn Belt and in the great seed-producing areas of the Pacific Northwest, and in the Great Plains there has been an extensive seed program in connection with crested wheatgrass, brome grass, blue grama, buffalo grass, the bluestems, and many others. Now that supporting prices have been established for many of these seeds, with opportunities for establishing others as the need may arise, further expanded production will be possible if sufficient effort is put behind the campaign.

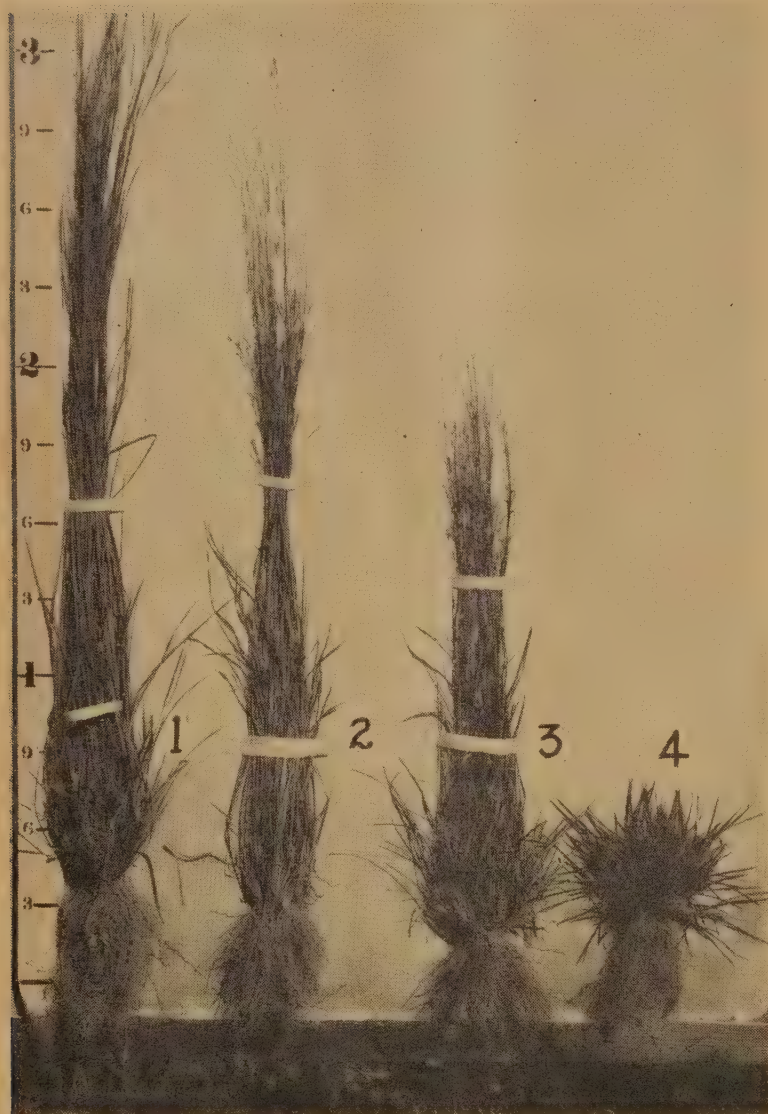
In connection with the establishment of supporting prices, recognition has been given to improved certified strains and varieties. Wherever there is a fair quantity of improved seed available, the supporting prices have been established for increased production of these strains at a price from 4½ cents to as much as 20 cents per pound above ordinary seeds. This applies in the case of alfalfa, red clover, biennial white sweetclover, biennial yellow sweetclover, timothy, smooth brome grass, orchard grass, Bermuda grass, bahia grass, and meadow fescue. This is a wonderful opportunity to encourage certified seed production. Some of these improved strains are highly productive and should be increased as rapidly as possible.

The Nursery Division of the Soil Conservation Service has arranged with the Bureau of Plant Industry, the State experiment stations and the Crop Improvement Associations to use the nursery facilities to increase seed of improved strains and varieties so that a sufficient quantity of seed may be obtained to place with farmers for immediate production. It has always been extremely difficult to project a small quantity of improved seed into commercial production and the soil conservation nurseries are now attempting to fill this gap which

(Continued on page 261)

NURSERIES' PART IN WARTIME SEED PRODUCTION

By Harry A. Gunning¹



Care must be exercised in selecting locally adapted strains of grasses. Here is shown a typical response with native species. Grown at Elsberry, Mo., little bluestem seed sources are (1) Stillwater, Okla.; (2) Manhattan, Kans.; (3) Moorehead, Iowa; (4) Mandan, N. Dak. The Oklahoma source seed does not mature seed at Elsberry.

DURING 1933 and 1934 the Soil Conservation Service operated over 100 plant production nurseries and carried on extensive native grass and tree seed collecting programs in every State and nearly every county. Many of the nurseries consisted simply of an acre or two of land convenient to a CCC camp, where a few thousand black locust seedlings were produced for local use. Seed collecting was then usually an unorganized gathering of material without regard to quality, knowledge of the species, or consideration of the labor cost. To meet the widespread demand, enormous amounts of planting materials were assembled. Many of the old CCC work

areas and demonstration projects are now clearly defined by plantations of thriving trees, four, six, and eight years old—a real monument to the work done at that time. Gullies were stopped with kudzu plants, waste areas were protected by grass and legume seedlings and, most important of all, there was developed an appreciation of the fact that plant cover is the most effective means of controlling erosion.

In 1935, the Nursery Division was made responsible for supplying all the planting stock required for Service operations. The small, widely scattered nurseries were consolidated into 30 large units. *During the period 1935 to 1942 the nurseries produced approximately 900,000,000 usable nursery-grown plants, an average annual production of nearly 125,000,000!*

Seed collection also was assigned to the Nursery Division. Needs of work units were ascertained, and a system established for collecting, purchasing or growing required materials. The nursery units, well spaced throughout the country, took over these functions within their operative radii. Special seed collecting equipment was developed. *During the period 1935 to 1941 nearly 5,000,000 pounds of native grass and legume seed were collected and supplied to field work units of the Service.*

The war has had a pronounced influence on our nursery work and objectives. Insistence that every farmer put his every effort into food and fiber production, the shortage of farm labor, the closing of CCC camps and the elimination of WPA funds all contribute to a reduced production and use of woody plant materials. No matter how keen the farmer's interest may be in planting waste areas to trees and in establishing shelterbelts or windbreaks, his time is limited and his regular operations largely monopolize his attention. Amazingly, however, the farmer's interest in tree planting has not decreased in proportion to these stringent demands. Now that money is more plentiful and crop prices are good, the farmer is interesting himself in permanent improvements of this sort. In tree planting, he finds the best use for certain areas and a high road to long-term objectives without neglecting the demands of the moment. The Nursery Division helps to keep this interest alive by continuing to supply woody planting materials to SCS work units in proportion to the farmer's desire to handle the material and the division's ability to produce the stock.

¹ Editor's Note: The author is Chief, Nursery Division, Soil Conservation Service, Washington, D. C.



African love grass, Tucson soil conservation nursery.

The trend in Service use of grass and legume seed for soil and moisture conservation is exactly opposite. The demand for more livestock and livestock products emphasizes the necessity of pasture, range, and meadow improvements. Increasing quantities of grass and legume seed are being asked by soil conservation districts for this and related soil and moisture conservation purposes. *Preliminary estimates indicate that as much as two million pounds of seed could be used advantageously by soil conservation districts and land utilization projects during the fiscal year 1943.* This is more than twice the quantity used in 1942.

Prompted by the demonstrated value of grass and legume seedlings to the food-for-freedom program, the Service will make every possible effort to meet the heightened demands for seed. Current transportation difficulties and labor shortages, however, make our goals seemingly unattainable unless our efforts are supported by hearty and intelligent co-operation in local seed-usage centers. Accordingly, two supplementary sources of procedure have been formulated: (1) provision for the establishment of seed-increase plantings of superior grasses and legumes in soil conservation districts, as a source of improved seed stocks; (2) the utilization of available resources within districts for the general production and collection of seed.

Recently, the Department of Agriculture developed a plan to encourage farmers by price stabilization and market assurances, to grow grass and legume seeds. These seeds are needed not only to meet domestic requirements but for Lend-Lease and for reseeding newly developed Army and Navy cantonments, airfields and camps. Seeds supplies of most of our commercial grasses and legumes are far below normal requirements and unless a sustained annual production is maintained our livestock production unquestionably will suffer.



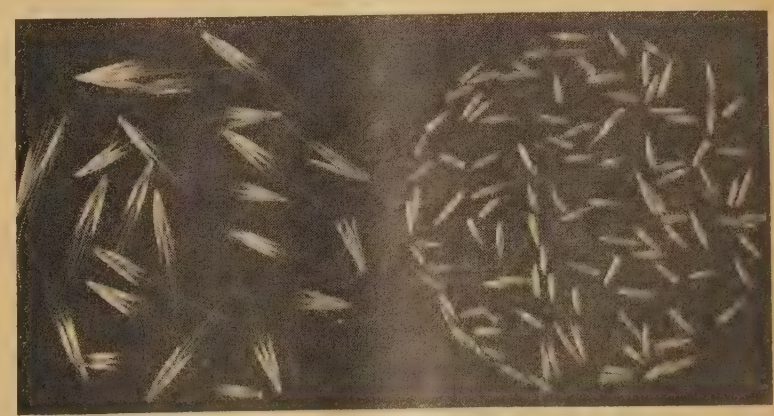
Big blue grass on Oregon land previously cropped to wheat alternated with summer fallow for about 40 years. Yield, about 500 pounds per acre.



Increase field of big bluegrass on Pullman, Wash., nursery, developed by observational testing out of several dozen accessions collected in the Pacific Northwest. Estimated yield not less than 400 pounds per acre.



Strains of Canadian wild rye from—right to left—Caldwell, Idaho; Bozeman, Mont.; Saskatchewan, Canada; Yakima, Wash.; Oroville, Wash. Wide variation indicates wide conservation uses.



Bulbous barley; typical threshed spikelets at left, deawned seeds at right.

The Soil Conservation Service is in an excellent position to help in the situation. Pasture, range, meadow improvement, grass-legume rotations and revegetating erodible land are accepted soil conserving practices which have been emphasized in the farm plan and in our work with soil conservation districts. To encourage such practices, we have demonstrated their feasibility, have designated the species of grasses and legumes to use and the proper methods of establishment. We have supplied seed of those species not readily obtainable commercially. We have made it possible for farmers and districts to establish seed plots as local sources of planting material. We have provided seed of improved strains and selections. We have provided technical assistance and in some instances machinery, so that the farmers within districts may harvest seed for their revegetation programs. Stimulating seed harvesting through soil conservation districts will in itself be a simple and effective step in helping to meet the national world-wide shortage.

The new seed program of the Department lends impetus to one phase of research desired by agricultural workers for many years. Improved strains and varieties will receive premium support prices under the program which has received State approval. Thus, the work of the plant breeder becomes recognized and the farmer who grows the higher quality product is rewarded proportionately. The incentive thus given to grow improved selections of grass and legume seeds is expected to be far-reaching in its effect upon seed, forage, and hay production.

The observational work of the Nursery Division has as its primary objective the finding of better plants for erosion control purposes. By cooperative agreements and mutual understanding, we work closely with the Bureau of Plant Industry and the State experiment stations in an endeavor to bring new plant materials resulting from breeding and selection direct to the farmer. In our observational nurseries promising grasses, legumes, and other plants are assembled from all possible sources. We make these plant materials available to the plant breeders for study and hybridization. Our facilities and land are available for maintaining foundation seed stocks and, with the consent and approval of all cooperating agencies, selections, strains, varieties, and species are increased to quantities sufficiently large to be rapidly extended for general farm production. Thus we bridge the gap between research and the application and use of research on the farm.

Our several administrative regions arrive in various ways at about the same common objective. The

district seed plot plan is in nearly universal use. It provides an organized procedure under which farmers are selected by the supervisors of soil conservation districts to receive foundation seed stocks produced in Soil Conservation Service nurseries—seed stocks originating from cooperation with other bureaus of the Department and the State experiment stations. In some instances, soil conservation districts have rented or even purchased land upon which they cooperatively undertake the production of certain species of grasses and legumes wanted for revegetation work within their confines. Elsewhere, the Service has supplied individual farmer cooperators of the district with small quantities of seed for establishing farm seed plots. Usually, the farm seed plot is merely for the purpose of providing material for additional planting on the one farm. The three forms of procedure lend themselves well to the present effort of the Department.

The district seed-plot plan will in all probability be most effective in stimulating seed production. Under this procedure the seed to be increased within a given State is selected with the concurrence and cooperation of both State and Federal agencies. It must have passed all adaptation and comparison trials and be acknowledged as superior to ordinary commercially available varieties. The seed growers are selected by the district supervisors and approved by the State and Federal agencies. Growers, and the land to be used, must comply with and maintain standards which will permit certification of the seed, if and when desired. Foundation seed stocks will be maintained in SCS nurseries as long as the cooperating State and Federal agencies deem it desirable.

Fostered and facilitated by the nursery, agronomy, and range divisions of the Soil Conservation Service, the Divisions of Forage Crops and Diseases and Dry Land Agriculture of the Bureau of Plant Industry and the State agricultural experiment stations and Extension Service, the district seed-plot plan is expected to prove to be one of the most effective programs of the Department for promoting conservation farming and increased food production.

J. C. Stapleton, Trough Creek, Pa., avers that contour strip cropping has increased the yields on his farm by 20 percent in 3 years. Contour furrows, liming and fertilizer, doubled the carrying capacity of his pastures. He has been increasing his beef herd steadily and has more and better feed for them each year.

TEMPORARY PASTURES for WARTIME PRODUCTION by Mason Hein



1. A Carolinian Sudan grass pasture. 2. Rape pasture making pork in Maryland. 3. Tennessee whitefaces find this lespedeza good grazing. 4. Poor cows nibble at a not-so-good native pasture.

TEMPORARY PASTURES are those used for grazing during a short period, usually not more than one crop season. They are of very diverse kinds to meet regional and climatic demands, and their value for maintaining livestock production has been well demonstrated in the past. During periods of drought, they have been particularly effective and have saved many a fine herd from disaster. The emergency that now exists has nothing to do with drought, but *the American farmer has been asked to increase his production of meat and dairy prod-*

ucts, and the use of temporary pastures is one of the measures he can take to help him comply with this request. Temporary pastures may be used for all or a part of the grazing season and are valuable stabilizers of seasonal production. They may be seeded in early spring, about corn-planting time for mid and late summer use, or in early fall for late fall and early winter grazing. This gives the farmer a wide choice of crops for this purpose. The exact time of seeding and the period of availability for pasture of the various crops used will vary with the regions where used.

A crop that may be grown in practically all regions of the United States, except in the extreme

EDITOR'S NOTE.—The author is senior agronomist, Division of Forage Crops and Diseases, Bureau of Plant Industry, Soils and Agricultural Engineering, Washington, D. C.

north, is Sudan grass. Sudan grass plantings should be delayed until the soil is warm, which is usually shortly after corn planting time, and planted any time thereafter, depending on the length of the growing season. Under dry-land or semiarid conditions, plantings should be made early, since soil moisture may be lost, resulting in poor germination and uneven stands. Under favorable conditions, this grass is ready for grazing 6 or 8 weeks after seeding, but should not be grazed until it has reached a height of 8 to 12 inches. In Wisconsin, it has been recommended that grazing be delayed until the growth is two or three feet high, because in the less mature growth, or where the plantings have been stunted by heat or drought, some injury to livestock due to Prussic acid poisoning has been sustained under their conditions. For maximum returns rotation grazing is recommended, and to prevent injury from trampling, it should not be grazed after heavy rains or irrigation.

The pasture season of Sudan grass varies from 45 to 100 days. Depending particularly upon soil and climatic conditions, Sudan grass has a carrying capacity of two to three animal units per acre. This ideal summer temporary pasture should be used extensively, since seed is cheap and plentiful.

In the extreme North, where Sudan grass is not so well adapted, Japanese millet is a good substitute, or adapted varieties of foxtail millet may be used. The millets make very rapid growth, and can be seeded in late spring or early summer and still produce a satisfactory crop. The foxtail millets are better hay than pasture crops, because of their slow recovery after grazing. Japanese millet, where adapted, will probably be more productive.

Soybeans, an excellent forage for pasture or hay, make a desirable combination with Sudan grass. While such a mixture will not produce a greater yield than soybeans alone, the combination makes an ideal pasture.

In the South, pearl millet is one of the best temporary summer pastures. It makes a very good growth on ordinary soils without fertilizing. It can be planted any time from April to June. In general, the crop is not affected by disease or insect pests, and, for this reason, it may be more productive than Sudan grass, since common Sudan grass is rather severely injured by foliage diseases. The grazing of pearl millet should start when the plants are eight to 10 inches high. When the grazing is delayed, the plants go to seed, and the grazing season is automatically shortened. At Tifton, Georgia, pearl millet has carried better than one animal per acre from early July until mid-September, with gains of almost 150 pounds per acre.

Any of the adapted varieties of annual lespedeza makes ideal temporary pasture during the summer months, in regions where they do well. In Missouri, extensive use is being made of Korean lespedeza as a summer supplemental pasture. The Korean lespedeza is sown in the small grains in the spring, or where it has been seeded previously, it will volunteer under proper management, in the small grain plantings. Spring seedings of grass-legume mixtures in small grain may also furnish some temporary pasture in late summer, without injury to the succeeding year's growth.

For temporary fall pastures, the cereals—rye, wheat, winter barley, and winter oats—are the most desirable crops, where adapted. They may be seeded alone or in combination with vetch, crimson clover, or bur clover. If planted in late summer or early in the fall, 2 to 5 weeks' grazing may be obtained before winter retards the growth. In the south, the season will be longer, and it is possible, under favorable conditions, to have some grazing during every month in the winter. Rye, because of its winter hardiness and ability to withstand cold, can be seeded over a much longer period than other fall-sown cereal crops. Depending upon the region, fall-sown crops of wheat and rye will provide 2 or 3 weeks' grazing late in April, and then may be allowed to mature for grain harvest. The spring grazing of these winter cereals may benefit the crop where there is excessive straw growth, otherwise yields of grain may be reduced.

In Rhode Island, it was found that winter rye, planted at 10-day intervals from August 10 to September 20, furnished pasture from October 1 to October 25 in the fall, and from May 1 to June 10 in the following year. Wheat under similar conditions was less productive. The rye furnished sufficient grazing to carry two cows per acre in the fall for 2 weeks and for 5 weeks in the spring. At Tifton, Ga., Abruzzia rye furnished grazing from February 4 to April 14, while winter-sown oats furnished grazing from February 2 to May 6. The oats gave a slightly higher gain per acre than the rye.

Oats is one of the most palatable and nutritious of the cereals, and will furnish later seasonal grazing than any other cereal. Oats may be seeded in the fall in the south, and seeded earlier than other cereal crops; in the north, spring seeding is best. It does well seeded alone. In some sections, oats and field peas make an ideal combination, particularly on the more fertile soils. For swine or sheep pasture, Dwarf Essex rape may be added to the oats. The oats will supply the early grazing, and the animals will, no doubt, like it better than the rape. The rape will furnish desirable pasturage for midsummer and often

until early fall, after the oats has matured or been consumed.

Where adapted, legumes such as alfalfa, sweet-clover, red clover, or Korean lespedeza may be seeded at the same time and with the oat crop, or seeded in the spring on a fall-sown cereal crop. The alfalfa and clovers may give some late summer pasturage the first season without injuring the next season's growth.

Italian ryegrass may be used, but it is not so productive on unfertilized land as oats or rye. Italian or common ryegrass seeded with small grain makes an ideal combination for temporary fall and spring pastures. The ryegrass makes a very good bottom growth, and, at the same time, adds to the production. Ryegrass alone, or in combination with crimson clover, is an ideal fall and spring temporary pasture in the central latitudes on the more fertile soils. Because of its extensive root system, it is also very desirable for soil improvement and conservation purposes.

The Utah Station has recently reported on the use of common rye for temporary or supplemental pasture for their cattle and sheep range land. The planting of rye on sagebrush land depleted of grass cover is proving to be a very desirable practice. The land is plowed with a one-way disk, and, at the same time, 25 to 30 pounds per acre of rye is seeded. The cost of plowing and seeding amounts to approximately \$1.25 per acre. The plowing kills approximately 90 percent of the sagebrush, but this

material is left in place to protect the land against erosion. This rye pasture will furnish spring grazing for 1 month to 6 weeks, and at a time when the sheep are being moved from the desert range or the cattle from the feed yards or from winter grazing, and is adapted to areas of moderate elevation where the grass cover has been reduced by overgrazing or drought. It also has been found that this type of management has increased the lambing percentage, and the marketed weight of the lambs.

To insure the best returns from these temporary crops, adapted varieties must be used. Foliage diseases, rust, or smuts may severely injure the growth and defeat the whole program. Too much emphasis cannot be placed upon using improved strains or varieties where available. The State experiment station, extension agronomist and county agent are in touch with local sources of seed, know the best varieties to use, and can help you to get them.

Finally, temporary pastures are not only effective in insuring maximum production, but they are also ideal for preventing soil and water losses. They are vital to any good soil conservation and pasture program, in that they improve the soil, prevent run-off, and at the same time, are most useful in stabilizing pasture production throughout the growing season. The temporary pastures will protect the permanent or semipermanent pastures from overuse and injury, and more than pay their way toward meeting production demands.

Use of fertilizers is just one of many practices that are necessary to good farming. Careful attention to the other practices is essential if fertilizers are to be used efficiently. This means erosion control; good cultivation; good seed of high-yielding, disease-resistant varieties; rotations that include enough legumes; liming acid soils; conservation and use of manure.

The farmers of this country are now being asked to produce unprecedented quantities of food, feed, fiber, and raw-material crops and they must do this under the handicap of labor and machinery shortages. For this reason they are trying to use every available means of producing at the lowest unit cost possible. It is indeed fortunate that fertilizer supplies for this season have not been too seriously curtailed.—

THE EDITOR.

FERTILIZERS FOR 1943

BY H. R. SMALLEY¹

THERE WILL probably be nearly enough fertilizer for all crops grown in 1943 with the exception of certain crops of lower food value or of which there are large surpluses. However, *to make sure that all available fertilizer is equitably distributed* and used to the best advantage, a plan of distribution has been developed by Federal and State agencies in cooperation with the fertilizer industry.

Fortunately, we appear to have nearly enough phosphate and potash fertilizers; but owing to the fact that nitrogen

is used to make explosives, our domestic production, although greatly expanded, has not been sufficient to supply all of our fertilizer needs and we are still importing large quantities of Chilean nitrate to make up the shortage. *If imports of Chilean nitrate of soda are maintained* during the next few months, nitrogen supplies for the 1943 season will be reasonably satisfactory—much better than seemed possible a few months ago. Even so, however, there may not be enough of all kinds of fertilizer to meet the heavy prospective demand, and it has been necessary to plan its distribution carefully to prevent some farmers from getting more and others less than their fair share of the available supply.

¹ Chief Agronomist, The National Fertilizer Association, Washington, D. C.

FEWER GRADES

The first step taken was to reduce the number of grades of mixed fertilizers that can be sold in the important fertilizer-using States in the interest of economy in manufacture, distribution, and use, and to select grades that average somewhat lower in nitrogen content than the grades formerly used.

In selecting the grades which are being sold this season, the recommendations of agronomists and horticulturists of State agricultural colleges and experiment stations were considered at regional conferences. These conferences were attended by representatives of USDA, WPB, State agricultural colleges and experiment stations, State departments of agriculture, farm organizations, and fertilizer manufacturers. For varying reasons, some changes in the recommendations were made, but in the main the grades finally selected are those that agronomists and horticulturists recommend for use under present supply conditions. In many cases they are not the grades that will be recommended when plenty of nitrogen is again available.

The second step in nitrogen conservation was to prohibit the use of chemical nitrogen in fertilizers for fall-sown small grains to be harvested for grain and for such non-essential uses as golf courses, lawns, parks, etc.

This order also prohibits the use of chemical nitrogen in mixed fertilizer for spring-sown small grains to be harvested for grain, but nitrogen materials can be used for top-dressing both fall-sown and spring-sown grains, and mixed fertilizers containing chemical nitrogen may be used as top-dressing on fall-sown small grains.

PRICE CONTROL

In some regions by special action the Office of Price Administration has permitted small increases in fertilizer prices, but these increases were allowed only to cover some of the increased cost of materials and transportation. Manufacturers must absorb increased labor and other costs. Fertilizers are still relatively low priced, however, as compared with prices of other commodities the farmers buy or with prices of farm products.

APPLICATION FOR FERTILIZER

Each farmer who uses fertilizer in 1943 is required to apply for it by filling out a simple form stating how much fertilizer he used in 1940-41 and on what crops, how much he needs in 1943 and for what crops. If for some good reason 1940-41 figures are not available, the 1941-42 figures may be used instead. He must also state how much fertilizer he has bought since July 1, 1942, and how much, if any, he has on hand.

Each fertilizer manufacturer is required by Food Production Order No. 5 to distribute the fertilizer which he manufactures and the chemical nitrogen materials allocated to him equitably among his customers but with due regard to the requirements of the crops now designated as "A Crops" by the U. S. Department of Agriculture.

Each farmer who desires to buy fertilizer should go to the agent, dealer, or manufacturer from whom he purchased his fertilizer last year and make application in the manner described above. If he is farming a different farm from the one he farmed last year, he should apply if possible to the agent, dealer, or manufacturer who supplied fertilizer for that particular farm during 1941-42. If this is not possible or practical, he may apply to any other agent, dealer, or manufacturer who has enough fertilizer at his disposal to supply his old customers and this particular new customer. The fertilizer industry has pledged itself to make every effort to take care of these unusual situations with fairness to all concerned.

The order provides that, in general, farmers will be required to buy mixed fertilizers containing somewhat less nitrogen than they formerly used, but there are many exceptions to this general rule, particularly with reference to the Group A vegetable crops for which every effort will be made to supply normal nitrogen content in mixed fertilizers and normal quantities for side- and top-dressing.

CROP GROUPINGS

The Group A crops are: Field crops—castor beans, cotton varieties normally stapling $1\frac{1}{8}$ inches or longer, fiber and seed flax, guayule, fiber and seed hemp, hybrid corn for seed production only, peanuts and soybeans; vegetable crops—dried beans, snap and lima beans, beets, cabbage, carrots, kale, onions, all peas, peppers, Irish and sweet potatoes, spinach, sweet corn, tomatoes, and vegetable seeds; other crops—tung, and prunes, figs, raisins, apricots, and peaches for drying.

Group B crops are defined as all crops except those in Group A and those on which the use of fertilizer containing chemical nitrogen is prohibited by the order.

RATES OF APPLICATION

Group A crops will have priority as to fertilizer use. They are entitled to the usual or customary rates of application or to the rates of application recommended by State experiment stations, and to grades that are authorized by the grade substitution plan.

Producers of Group B crops may use mixed fertilizers containing chemical nitrogen or nitrogen materials, provided that during the 1940-41 or 1941-42 seasons they used such fertilizer on Group B crops or that it was used on these crops on the farms they are now operating. This means that a farmer who has not in the past used chemical nitrogen fertilizer on B crops will not be entitled to use it on B crops this year.

For Group A crops, excepting soybeans, peanuts, and cotton ($1\frac{1}{8}$ inches or longer) farmers may obtain fertilizer containing chemical nitrogen up to the quantities recommended by the State agricultural experiment stations. For Group A cotton, the quantity that a farmer may obtain is based either on his past rate of application or the rate customarily used in his area. For soybeans and peanuts the basis is the farmer's customary rate of application or the recommendation of the State experiment station.

For Group B crops the quantity of fertilizer that a farmer may obtain is, generally speaking, based on the rate of application used on the farm during either the 1940-41 or the 1941-42 season.

The use or delivery for use of chemical nitrogen fertilizers on melon or cucumber crops, except where grown for seed production or, in the case of cucumbers, where grown for processing, is prohibited.

RESTRICTIONS ON USE

In ten North Central States—Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Nebraska, Ohio, South Dakota, and Wisconsin—not more than half of the mixed fertilizer containing chemical nitrogen for use on field corn may be delivered before April 1, 1943.

Prior to May 1, 1943, not more than 75 percent of a farmer's requirements of chemical nitrogen as straight material can be delivered or used on field corn or cotton of varieties which normally staple less than $1\frac{1}{8}$ inches.

Farmers are required to use the grades of fertilizers which are approved for each of 38 States. The States for which no lists of mixed fertilizer have been approved are: Montana, Wyoming, North Dakota, South Dakota, Nebraska, Kansas, Colorado, Utah, Nevada, and New Mexico. There are no restrictions as to the sale of mixed fertilizers in these States.

No chemical nitrogen fertilizer can be used on golf courses, cemeteries, lawns, roadsides, parks, or on non-commercial plantings of trees, shrubs, or flowers. Fertilizers for use on military grounds and air force stations are exempt from all provisions of the order.

Town and city gardeners may now purchase only one grade containing chemical nitrogen, namely, 3-8-7, and it must be used for food production only. The first figure represents the percent of nitrogen, the second the percent of phosphoric acid, and the third the percent of potash. Gardeners may

(Continued on page 262)

FAMED LANCASTER COUNTY ACCEPTS WAR CHALLENGE

BY W. MARTIN MUTH¹



Good grass helps to boost wartime milk production on the farm of Enos Groff.

IT IS FITTING that Lancaster County, Pa.—celebrated from coast to coast for its agriculture—should have a soil conservation district whose co-operators are mainly concerned with setting some sort of record in war production.

The Lancaster district covers 15 townships containing 2,930 farms and 183,565 acres. From a beginning of three farms totaling 271 acres, for which agreements were made in November 1939, the district has grown to include 275 cooperating farms and 31,303 acres.

Significant is the fact that conservation methods continue to rise in favor as production needs become more urgent. Last year 57 new cooperators brought 7,302 more acres under conservation planning.

Particularly good examples of what a fine agricultural community can do to supply the demand for new crops to meet specific wartime needs are found in Lancaster's experience with two crops in 1942. Soybeans for oil were increased 300 percent. Belladonna, a crop never before grown in Lancaster County, was planted on 200 acres; the satisfactory yields obtained have been of material assistance to the Government in helping to provide an important drug.

Success in attaining generally increased crop yields for 1942 promises well for still greater production in 1943. As compared with 1941, typical increases for Lancaster County last year were 15 percent for sweet corn, 20 percent for peas, 25 percent for tomatoes, and 3 percent for potatoes. As for livestock, beef was up 5 percent, cows 10 percent, dairy products 12 percent, poultry 8 percent, and hogs 7 percent.

The following comments by district cooperators are typical of many reported to district offices.

"Yields are higher on wheat, corn, tomatoes and other crops . . . most efficient way to save moisture I have ever seen . . . a team can do 20 percent more on the contour."—Donald Weicksel, Christiana.

"Corn at least 15 percent better and tobacco 200 to 300 pounds an acre more than when farmed in square fields . . . hay yields doubled."—George Cramer, Pequea.

"Strip fields and contouring increased yields of corn, tomatoes, tobacco, especially tobacco . . . got 2,400 pounds of tobacco to the acre, 70 tons of tomatoes on a little more than 4 acres . . . easier to work in contour fields, and I save 10 to 15 percent on fuel too."—Arthur Brown, Nottingham.

As a means of keeping cooperators up-to-date with recent conservation developments and to promote interest within the district, a series of 10 educational

¹District conservationist, Lancaster, Pa., Soil Conservation District.

meetings was held last winter. Each meeting was held in a different township so that everyone interested could conveniently attend. The large attendance and the interest of those present proved the soundness of the idea. Each program was led by a district supervisor and a farm planner was present to discuss technical matters. A representative from the AAA spoke on the AAA program for 1943. Moving pictures were shown, including "The Heritage We Guard," "Wartime Farming in the Corn Belt," "Muddy Waters," and "The Living Land." The meetings concluded with general discussions by farmers and panel leaders.

In January, the supervisors sent a letter to all co-operators, warning against plowing adjacent contour strips in the effort to meet production goals for cultivated crops. The letter pointed out that planning crops so as to maintain alternate strips of close-growing and cultivated crops will accomplish more to aid the war effort and will better protect the farmer's investment.

The importance of this caution is reflected by the fact that 8,415 acres within the district are cultivated on the contour, and 7,289 acres have been strip-cropped, involving 180 acres of obstruction removal. There are ten miles of diversion ditches, four miles of terraces, and over 9,000 feet of outlet channels.

The Lancaster co-operators appreciate that it saves labor and machinery to have good pasture land for stock, rather than unnecessarily to supplement poor

pasture with cropland products for feed. Fertilizing and liming have accordingly been increased, thus aiding the war effort by improving both the yield and the quality of pastures. Contour furrows on 191 acres help pasture growth through retention of moisture.

Cover crops are being used extensively on many district farms. Rye-grass is the most generally favored cover, being sown 15 to 20 pounds to the acre following the last cultivation of corn.

Within the past year a satisfactory working agreement has been reached between co-operators, district supervisors, and State Highway Department for the control of water run-off and silt deposits on highways when the source is adjacent farmlands. The district helps the cooperator plan for control, and



War production by conservation methods, as practiced on the farm of Ezra Hershey.



Belladonna, important drug plant, was grown on 200 Lancaster County acres last year.

aids with labor, equipment, and materials. The Highway Department cooperates in maintaining control along the rights-of-way.

What conservation farming can do to help the Highway Department in Lancaster County is attested by Charles D. Shriver, caretaker of highways in two townships within the district. "It cost over \$350 in a single summer to haul away silt washed onto the road from the fields of one farm which did not employ conservation methods," said Shriver. "But there was no mud or silt to be cleaned from the road ditches bordering the adjoining farm, which had contouring and diversion ditches to protect the farmland. I have 28 miles of improved road to look after. Over \$2,000 road maintenance a year would be saved if all the farms along these roads had conservation farming in effect every place it was needed."

The supervisors of the Lancaster district are now pushing a program for widespread application of



strip cropping and contour cultivation as Lancaster County nows it. One of the farms shown here is owned by Hartwell E. Roper, district cooperator.

conservation practices. Whereas formerly they required a complete soil and moisture conservation plan, today they are assisting with any phase of conservation in which farmers are interested, be it one or more practices. For instance, a farmer who requests assistance for control of erosion in one field will be given such assistance, even though only one phase of conservation is to be involved. During the 1943 crop season, strip cropping and contour farming particularly are expected to be on the increase, due to interest shown in these two practices by the farmers within the district, and because of payments for such practices offered in the AAA 1943 program.

An association originally limited to cooperators and organized to handle lime distribution in a soil conservation project, having accomplished its purpose, has just been reorganized as the Lancaster County Land Conservation Association. With membership now open to farmers and others interested in the conservation of natural resources throughout the county, the new organization aims to further the conservation movement in all its forms not only within the district but throughout the entire county. It is affiliated with the Pennsylvania Land Conservation Association. Its board of directors will include representatives of each of the 15 townships within the district, and each member of the board will be responsible for the work of the conservation movement within his own township. It will undoubtedly be worth following the development of this organization, which is one more example of the spirited determination of the farmers within the Lancaster Soil Conservation District to further every means of advancing the war effort through conservation.

ACRES ARE ACES

(Continued from page 248)

One of the biggest chunks of the United Nations cropland assets is right here in the United States—the Corn Belt—an area which stretches from Central Ohio west to Central Nebraska, and from Southern Minnesota south to Southern Missouri, a total of more than a quarter million square miles, the largest piece of fine farm land in the world with a good agricultural climate. That one patch of land, which produces enormous quantities of corn, hogs, poultry and eggs, milk, cheese, beef, soybeans, flax, fruits and vegetables, looms large in the calculations of the United Nations high command; for when you get right down to brass tacks, it may well figure out that the vital supplies that spell the difference between success or failure will come from those millions of acres in just one part of the country.

Acres are aces in this grim game, and we of the United Nations hold the aces, but we must play them right. It is even more dangerous to spend soil resources extravagantly than it is to spend money extravagantly . . .

SEED FOR CONSERVATION PRODUCTION

(Continued from page 251)

has prevented rapid increase in past years. Recently improved strains of brome grass developed under this arrangement have been placed with farmers in soil conservation districts in Iowa to secure as rapidly as possible sufficient seed for commercial production. The same arrangement applies to other grasses and legumes wherever improved strains are available and increased seed supplies are needed.

The Soil Conservation Service has been authorized and instructed by its Chief to include seed production in its conservation-production activities. Other bureaus of the Department will also be working in this direction and every effort should be made to develop a departmental seed-production program. It will involve cooperation with State agencies that are also interested in seed production as a part of the food production program. Soil conservation district supervisors will be anxious to facilitate seed production in the districts and they should be given all possible assistance. Let's make a real effort, individually and collectively, to be of all possible assistance in the production of ample seed supplies that are so urgently needed to meet the tremendous demands for food and feed to win the war.

FERTILIZERS FOR 1943

(Continued from page 258)

also buy any grade containing *only organic* nitrogen and use it either for food production or for fertilizing the lawn, shrubbery, or trees.

Farmers may use on their gardens any grades of fertilizer which they may lawfully purchase for use on crops.

Farmers who desire to purchase fertilizer materials for home mixing may do so provided that the amount of chemical nitrogen purchased does not exceed the amount which each farmer would be eligible to purchase in the form of mixed fertilizer.

Any mixed fertilizer containing *organic nitrogen only* may be sold or used provided it contains at least 3 percent of nitrogen and 14 percent of total plantfood.

The lists of grades which have been approved for the various States and recommendations concerning their use have been given wide publicity within the States and are not repeated here.

March reports showed 2,396 men and women of the Soil Conservation Service on uniformed duty with the Army, Navy, Marine Corps and Coast Guard; 7 killed in action; 2 prisoners of war somewhere in Japan. Every day the totals increase, as reports of new inductions or enlistments come in.

Consciousness of the personal sacrifices being made by Service employees on the fighting fronts undoubtedly had much to do with the outstanding success of the recent Red Cross War Fund campaign. "We went over the top," commented the Chief, "not only a hundred percent but more, at a time when rising prices, income tax, and other financial worries made the outlook none too bright. I salute your patriotism, your efforts, and your belief in our democratic manner of living."

Henry V. Kent, Montgomery County, Miss., estimates that \$165 expended for use of a tractor and bulldozer in carrying out a drainage plan on 100 acres will be worth at least \$500 a year to him. It enabled him to increase corn production from 500 to 1,500 bushels, and to convert to pasture 20 acres formerly used for row crops.

J. M. Harrison, Johnson County, Ga., has a 75-acre pasture that is carrying three times as many cattle this year as before, because of a pasture improvement program worked out with the assistance of SCS technicians in the Central Georgia soil conservation district. Livestock was increased from 20 to 61 head grazing continuously, and it could have carried 10 to 20 more, according to the owner, who estimated that 120 could be carried easily for a period of 90 days.

"The young Hereford steers grazing the improved pasture have made a fourth to a third more weight than those on my old pasture," said Mr. Harrison. "They are of heavier build and will make heavier stock at maturity."

Edward G. North, Punxatawney, Pa., finds that it requires less power to farm in contour strips. He sold a hay loader several years ago because he was unable to use it in his square-field, up-and-down layout. It was too much for his team. Since he began farming on the contour, he has bought another hay loader and now uses it with either team or tractor. He cuts grain on contour strips with one team and a 7-foot binder.

During the 5-year period ending in 1940 a group of farmers in the LeRoy, Ill., soil conservation demonstration project area who had been using a complete protection program averaged a net income of \$1,911 a year. A similar group of farmers in the same county, who prided themselves on their straight furrows, made an average annual net income of \$1,277. That is a \$634 margin each year in favor of conservation farming for that 5-year span.

Conservation has done something for a 312-acre farm near Roscoe, Ill., that 5 years ago produced only "a crop of sandburs and weeds." Today it grows feed aplenty for a fine herd of 42 Guernsey milkers, 40 head of young stuff, 110 fattening porkers.

Near Shenandoah, Iowa, 66 men who farmed the conservation way averaged \$2,141 net income in 1940. Fifty-seven farmers who did not have a conservation plan netted \$1,694 each.

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Compiled by **ETTA G. ROGERS**, Publications Unit



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Around the hill to Victory! Throughout the Nation farmers are employing contour—on the level—farming to hold soil, water, and fertilizer on the land, and to bring to bear the new knowledge of how to increase crop yields through conservation methods. Under stress of war necessity a modern agricultural pattern is being spread across rural America. Old wasteful methods are being abandoned not only for the duration but forever on thousands of farms which will never again permit the prodigality of the thoughtless rip-and-tear era.

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WELLINGTON BRINK
EDITOR

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CHIEF, SOIL CONSERVATION SERVICE



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SOIL CONSERVATION CAN HELP

BY JONATHAN FORMAN, B. A., M. D.¹

AS THE WAR DRAGS OUT the treatment which we give our land gains in importance every day. When victory shall be ours, the fundamental problem will be the depletion of the soil. Upon the soil's productivity depends the success of our attempts to rebuild our own wealth and bring prosperity and peace to our land and health to our people. Upon the soil's productivity depends also our ability to help the peoples of other nations to develop their own securities.

Up until the beginning of the first World War, overgrazing was the greatest single factor in the distribution and deterioration of our grasslands. World War I lasted but a few months. In that short time, 10,000,000 acres of our topsoil were sent down the rivers of the Midwest. In the excitement of that war and in the hurry to grow grain for ourselves and our allies, we really began the mass destruction of our grasslands with mechanized equipment. Great batteries of tractors hauling gang plows tore up the sod 20 to 30 times as fast as it was turned over by the pioneer's horses. This was the day of the "factory" farm. In the heydays of war, farms made money but after the war came dust bowl and bankruptcy; combines fell apart in the fields; many were buried in the dust.

This war bids fair to last much longer. At least, we must avoid wishful thinking and for our own safety plan as though it will. This means a maximum load on American agriculture for years to come, while we fight the war and do our part in post-war international adjustments. This strain on our soil is a challenge to all of us who have any interest in conservation of natural resources.

The food-production program for ourselves and our Allies will lack foresight and come to meet disaster in the end unless it utilizes all that we know about soil management. For the winning of the

war and the salvation of our people, our farms must no longer be operated as though they were mines; rather, they should be managed as the nicely balanced biological systems that they really are.

To win this war, and the peace, our people must be kept healthy. We cannot expect during these war days to attain optimum health, but we can keep ourselves reasonably free from disease and as physically fit as we possibly can on the food that we can grow. *It must not be forgotten in considering this problem that—as a country—we never have more than 60 percent enough food to set an adequate table.*

In the past, medical science has conferred upon those people who have availed themselves of the knowledge, the prevention of infections through vaccination and immunization, seemingly miraculous cures through new and powerful chemicals, and additional years, through the better feeding and care of babies. In the future, medical science promises to those individuals who will take advantage of the new knowledge of nutrition a greater stature, a better physique, increased resistance to infections, comparative freedom from the so-called degenerative diseases; the insertion of 10 additional years into the active mid-span of their lives; increased vigor and vitality at all age levels; the postponement of the usual signs of senility until the very end; more courage, better morale, a happier disposition, and a higher level of cultural attainment.

These will make almost a paradise of our peaceful days ahead. In the meantime, we must spend every effort to increase resistance against infectious diseases which always run wild in war time. Meningitis, tuberculosis, scarlet fever, measles, whooping cough, diphtheria and influenza threaten us. We must, therefore, pay much more attention to the matter of eating for health.

Because winning the war is so intimately bound up with the morale and political thinking of our people, we must do everything we can to ensure a

¹ Editor of the Ohio State Medical Journal; Lecturer on Medicine in the Ohio State University.

good state of nutrition for all. When people are physically fit, they are alert; their judgment is sound. They are free from unnecessary fatigue and capable of doing a full day's work. They have endurance. They do not tire easily and, what is usually not emphasized, they do not worry. They meet problems of life with common sense. If we are going to have the capacity to do the tremendous amount of work that must be done by every man, woman, and child in this country, without shirking or rebelling, to the end that we shall make total war against our enemies—and if we are going to maintain the fortitude and courage that must be applied to the task of helping others to recovery—it is going to take the very best obtainable nutritional state in the bodies of every single one of us.

The quality of our nutrition depends upon the quality of our food. The quality of our food depends primarily upon the quality of the soil upon which it is grown. We must, therefore, see to it that our soil is made as fertile as possible—and everything done to keep it that way.

To do the work of the world we must have energy-producing foods. These are primarily the sugars, starches and fats. To produce growth and make repairs we must have proteins and minerals; in addition, we must have an adequate amount of those minerals and vitamins which are essential to life.

The severe "starvation dropsy" which has followed in the wake of every major war is brought about by a lack of protein in the blood serum of its victims. We shall hear much more about this desperate disease before the war is over as it breaks out among the people whom the Germans have enslaved. We need have little concern about it as a possibility for our own people. Nevertheless, we must make certain that every one of our citizens, in spite of whatever food restrictions may become necessary, shall have the amount of proteins necessary to the growth and repair of his body.

So protein is our first concern among the vital foodstuffs, both for ourselves and our domestic animals. Life cannot exist without proteins. They are essential constituents of every living cell. In addition, many of the enzymes and hormones necessary to the lives of ourselves and our domestic animals are protein in nature. This is also of great concern now that we know we must all build up our natural resistance to infectious diseases, or at least the capacity to develop such resistance against our age-old enemies of tuberculosis, smallpox, diphtheria, epidemic meningitis, scarlet fever, measles, and whooping cough. These diseases are gaining strength and virulence by passing through large numbers of under-nourished people. So when they reach us they

are going to be that much more difficult to resist. If our people, then, are to outwit this threat of epidemics, not only must we and our children be immunized against small pox, diphtheria, lockjaw and whooping cough, but each must also have a smoothly operating mechanism to develop a high degree of resistance. All of these things, acquired immunity, natural resistance, ability to throw off infections once they gain an entrance, and the capacity to respond when physicians vaccinate, or give us immunizing injections, depend upon our having a complete reserve of amino acids.

Amino-acids are Nature's building stones out of which are constructed the various proteins. It was once thought that these amino-acids were of significance quantitatively only, but it is now known that certain amino-acids have qualitative significance and are essential for the formation of indispensable proteins in the animal organism. Of the 20 or more known amino-acids, some 10 are essential.

It must not be forgotten that the nutritive value of proteins varies greatly, depending upon the amino-acids that enter into their structure. In practical dietetics neither domestic animal nor man is ever restricted to a single protein as a source of necessary amino-acids. In general, however, we might suspect that proteins of animal origin would resemble more closely those of man and that, therefore, proteins in meat would have a higher nutritive value than those from any other source. Such is the case. As we would guess, milk and eggs contain all the amino-acids required by a growing animal. Most of us, however, get about 30 percent of our proteins from cereal. Here again, we get more protein if we use the whole grain of the cereal. The legumes, in general, contain rather high percentages of proteins. We may have to resort to them more and more as the war goes on. Cooking increases greatly their nutritive value. They, however, place a great drain upon the soil, and so more attention must be paid to maintaining the soil's fertility.

Protein depletion in our bodies may be the result of dietary deficiencies brought about by improper foods or possibly through the restriction of the diet because of certain diseases, the loss of serum proteins from the blood through the kidneys; or, it may result from the body's protein being burned to provide extra energy because the total intake of calories is too low. We, then, must add milk, eggs, meat, especially helpings from the internal organs, supplemented by whole-grain cereals, legumes, and potatoes if we are to get the necessary amino acids to build, repair, and protect our bodies. But the domestic animals that supply us with the milk, eggs, and meat can only get their proteins to pass on to



Dr. Jonathan Forman.

us from proteinaceous substances already fabricated by the plant. As Prof. W. A. Albrecht¹ points out, "They cannot use the simpler elements for making their proteins as in the case of the plants. . . . The feed quality of vegetation is largely a matter of whether it is mainly woodiness, or whether it is rich in minerals, protein, and all the accessories, both known and unknown, that the better forage feeds have."

As we call for forage rich in these nutrients, we are making greater and greater demands upon our soils. We must, therefore, be prepared to return the minerals which we borrow, and practice the wise use and conservation of all the vital elements, to the end that not only shall we have the health and strength to win this war, but shall come out of it with a soil with which we can begin again to recreate the wealth of the United States which we love and for which we have fought. This means we must not lose any of the important nutrients from the soil that ensure us a succulent proteinaceous forage.

The nutritional importance of the minerals becomes more clearly recognized, so that *it seems safe*

to hazard a guess that the great progress in nutrition in the immediate future will have to do with minerals. The nutritional importance of calcium, phosphorus, magnesium, sodium, potassium, chlorine, iron, and iodine have long been recognized. Until recently, however, little importance has been attached to the presence in plant and animal tissues of copper, manganese, zinc, cobalt, nickel, bromine, silicon, strontium, vanadium, aluminum, fluorine or selenium. In fact, their presence was thought to be incidental. They were looked upon in animal tissues as accidental contaminants from the soil. Today, we are beginning to see that these so-called "trace elements" may have an important connection with the nutritional needs of the body tissues of both man and beast. *And so it is becoming doubly important in these days when the emphasis is on production not to forget quality.*

It is not necessary here to emphasize the great destruction the soils of the United States have undergone. We are merely concerned now with keeping what we have and restoring something of the virgin fertility if we can. In our virgin soils there were some score of minerals. It is becoming apparent that even those that are found in the minutest trace may play a vital part in the nutrition of plants, animals, and human beings. Of these many minerals none is more important than phosphorus. Many diseases of animals can be traced directly to the lack of phosphorus and its associated calcium in their foods, and these in turn, to deficiencies in soils that produced the foods.

We all know about the part that calcium (lime) plays in the growth of bones and teeth and how it maintains normal blood clotting, normal rhythm to the beat of the heart, normal excitability to the nerves and muscle, and regulates the permeability of the membranes, so that foodstuffs once in solution in the body, can flow into and nourish all of its cells. When calcium is deficient all of these important functions are affected unfavorably. The victims become irritable, nervous, and sometimes real problems in behavior.

It is possible to vary the calcium content of the salad leaf manyfold by varying the calcium content of the soil in which it is grown. *With improper farm practices, lime is the first element to be washed out of the soil.*

While supplemental feedings of these chemicals to our livestock and ourselves are much better than not getting them at all, supplemental chemicals are far from being as efficient as chemicals obtained from a healthy plant. The plant does something to this lime. Professor Albrecht notes that "using sheep demonstrated the fact that putting the lime on the soil makes

¹ Prof. and Chair. of Department of Soils, Missouri College of Agriculture and Agricultural Experiment Station, University of Missouri.

lespedeza hay, for example, a much more efficient growth producer. Liming increased the yield of the hay by about 25 percent. Each pound of limed hay, however, was about 50 percent more efficient in terms of lamb growth resulting from consuming it. With the animals eating all the hay they could, those eating the hay given the proper soil treatment made 50 percent more gain. Because of the better crop yield, and the greater growth-producing efficiency of the hay, the limed acre was then about 75 percent more efficient in terms of increase in sheep weight." Professor Albrecht's studies show that unlimed hay was deficient in something which helped the animals (both sheep and rabbits) to build the calcium and phosphorus into their own bodies. They showed that the mere delivery of calcium into the digestive tract, and hence into the body of an animal, was apparently not enough. These essential minerals must enter into nutritional service for the plant first, if they are to be of the best service to the animal. The point of all this has been summarized by Professor Albrecht as follows: "As the soils become poorer for certain crops, and as substitutes are used, the substitute crops tend to become mere mineral haulers. Unfortunately, the minerals they deliver consist more of silica with no feed value, in place of calcium, phosphorus and all else of nutritive value that comes with them. An unbalanced plant diet offered by the soil cannot be offset by minerals added to the vegetative bulk used as feed, any more than wheat straw would be good feed when supplemented by saltpeter, limestone and bonemeal. Synthetic diets, at best, leave much to be desired." *The importance, therefore, of calcium and phosphorus to the welfare of ourselves and our children is becoming of increasing significance. We must learn to borrow these minerals and to return them again to the soil, if we are to survive.*

Those elements which are found in our tissues and in our foods in very minute traces are becoming appreciated. Almost everyone is familiar with the fact that in the Great Lakes Basin and in certain other areas of the world, iodine is missing from the soil. All are familiar, too, with the fact that the administration of a very small amount of this precious element to the masses of people directly through the use of iodized table salt, or indirectly through the use of iodized salt for the milch cows, prevents goitre and the development of those helpless idiots called cretins. Most of us, however, have not had the opportunity of seeing what iodine medication will do for children who are deficient but still getting a partial supply; how their little bodies develop, their brains sharpen, their nervousness and irritability disappear when they are given minute traces

of iodine. More of us are familiar with iodine deficiency in swine which results in the birth of hairless pigs. We also know about iodine's effectiveness in increasing milk production. It has recently been shown that in many areas throughout the world soil is devoid of iron, and the children and livestock in such areas suffer from anemia. In some of these areas there is also lacking a trace of copper, so that it is sometimes necessary to add copper to iron to prevent or cure this anemia. In certain restricted areas there is a shortage of cobalt which must be corrected before the anemia is controlled. While it is agreed that copper must be available before iron can be used for making hemoglobin, we do not understand so well the function of cobalt. The fact remains that cobalt has to be added to the salt mixture in certain areas if anemias are to be prevented.

The great extent of boron deficiency on many Podzolic soils has been discovered in the past few years. Boron is known to be essential for plant life and one suspects that future investigations will show what it is good for in the human. Manganese is known to be essential for the hatching of eggs and to prevent sterility in rats. Its lack produces definite disease in sheep and cattle and chickens, zinc has been shown to be an essential element in the development of plants and its absence is known to cause serious disease among them. Physicians are awaiting anxiously results of investigations which suggest that zinc has a vital role in the production of one's own insulin, and so may be related to diabetes.

Although it has been generally accepted that soil that is rich in organic matter and the other nutrient elements will produce plants that are more nutritious for both animals and man, it is difficult to determine just what relationship each of the elements may have. The diverse nature of the reported experiments and field observations argues against anything but a general conclusion. The multiplicity of nutritive factors points strongly to the belief that a deficiency of any one of the several elements may lead to a state of poor nutrition. And in order to have a state of good nutrition for plants, animals and men, we must have a well balanced supply of all these elements in our soil. Certainly the available data do justify accepting a relationship between soil fertility, plant growth and its nutritive qualities, and animal growth, resistance to disease, and longevity.

The agricultural emergency is as much one of good nutrition as it is of acreage or total yield. Indeed, *we should think of the labor, fertilizer and seed factors in terms of nutritional results instead of*

(Continued on page 274)

SHALL THEY LIVE

To Make the Crops and Feed the Troops?

By JOHN H. WETZEL

IF TOMORROW morning's newspapers were to carry the headline "No food available for the next 4½ days," we would be reading the most serious news since Pearl Harbor. The resulting confusion and hardships would seriously affect, if not completely undermine, our country's war program. It is hardly to be expected that this headline will ever appear, but the hypothetical loss of 4½ days' food supply for every person in the United States does have an appalling connotation. The time lost each year because of accidental injuries on the farms is equivalent to the labor required to produce this 4½ days' supply of food.

THE TIME LOST as a result of accidental deaths and injuries suffered by farm people in 1941 is equivalent to the labor required to produce 1,970,250,000 bushels of wheat or 1,313,500,000 bushels of corn, or 2,101,600,000 bushels of potatoes or 40,718,500,000 pounds of pork or 26,270,000,000 pounds of beef.

Made yet more graphic, this loss of time as a result of farm accidents translates itself into—

 15 bushels of wheat for each person in the U. S.
or
 10 bushels of corn for each person in the U. S.
or
 16 bushels of potatoes per person in the U. S.
or
 313 lbs. of pork for each person in the U. S.
or
 202 lbs. of beef for each person in the U. S.

While the time lost as a result of farm accidents has always been important to the country's food production, it becomes infinitely more serious now that we are fighting for our very existence. The shortage of available farm labor is more acute today than ever before. Land armies are being formed. Men in the armed forces are being released to go back to the land. We are even bringing labor from across our borders to ease the situation. Still, the huge toll of active labor taken each year by farm accidents remains to sap the supply of available farm workers. The 18,500 farm people who are killed each year in accidents, and the almost 2,000,000 more who suffer injuries which require them to stop work—if kept well and functioning—certainly would furnish a welcome addition to the critical labor situation.

To the average urban citizen there is no occupation which seems more healthful, calm and serene

than the outdoor life of the farmer. Plenty of fresh air. Lots of food fresh from the soil. No rush to make the morning bus or streetcar. Accident statistics, however, paint a different picture. The farmer is carrying on in one of the most hazardous of occupations. Out on the food production lines the yearly accidental death and injury toll far exceeds that of construction or manufacturing or transportation. The compensation insurance rate in one of our leading agricultural States is \$4 for the farmer, 80 cents for the steel mill worker, and \$1.50 for the cement plant employee. Even more alarming is the fact that the compensation rate for farm labor increased from \$2.50 to \$4 between 1930 and 1940. Ten years of climbing calamity—a decade of undercutting of the farm labor supply!

While the time lost as a result of agricultural accidents is vital to the crop production program, almost equally arresting is the effect which these accidents have on the Nation's pantry shelf—on every person who must eat if he would help win the war. In the scramble to make red and blue coupons come out even, farm accident prevention has indeed a vital place in everyone's daily life. A modern Utopia where no accidents occur may be beyond reach, but there is no gainsaying the benefits to be derived from even the smallest improvement in the record. A reduction of 50 percent in the number of farm accidents would help to clear up the present labor shortage and food crisis.

Wartime farming induces an increase in the number of accidents. Higher production means longer hours, greater weariness—eyes become less sharp by nightfall, hands and feet less sure. Early hours and late chores mean dim light in which to work, longer periods between meals. Raw workers, awkward movements, set the stage for mishaps. Young people, and old hands brought out of comparative retirement, find it easier for things to go wrong. Much of the hired help that is available is likely to be of

EDITOR'S NOTE.—The author is head of the Safety and Health Section, Soil Conservation Service, Washington, D. C.



War is enlisting the youngsters in many new and difficult farm jobs. Hazards increase.

a category not signifying A-1 physical condition. Unless stringent preventive measures are enforced, wartime labor supplies will not be all “net”—they will be tragically cut into by the accidents which, always far too numerous on farms, will become yet more commonplace.

No serious accident occurs except to an accompaniment of human suffering, and an accident on the farm creates much more distress than it would in town. There is no nearby hospital, and even in normal times the doctor may be 15 to 20 miles away. The present shortage of physicians, nurses, and hospitals in most rural areas is becoming acute and is certain to increase the distress caused by injuries. First aid training, which has recently become so much a part of the town dweller’s daily life, and could go a long way towards relieving distress from injuries, is practically nonexistent on the farm. It is true that many first-aid classes have been held in rural communities as a part of the civilian defense training but the average farmer has not had the time, tires, or gasoline to enroll in one of these classes. Open wounds, unless accompanied by severe bleeding, often go untreated, and provide an ideal home for the deadly tetanus germs that are present in most barns and barnyards. The economic effect of farm accidents also must be considered, inasmuch as so often the gradual breakdown of many stable farm families and lands has had its origin in the disabling injury of the farmer or one of his family.

Just as farm accidents sap the strength of our country’s agricultural manpower, so do farm fires sabotage our wartime food production. Any person who has seen the panic and helplessness that accompanies a farm fire, well realizes the effect a fire has on the farm family and the farm pocketbook. Each year more than \$100,000,000 in farm property is destroyed by fires that might have been prevented. The damp hay in the barn, the overturned lantern and the lightning rod cable that is not grounded, all are saboteurs which must be guarded against day and night. That bright red glow in the evening sky does not always mean “just another barn” on fire—it may mean a lost life, and it is sure to signalize a financial catastrophe from which few farmers ever completely recover. As farm accidents are preventable, so are fires; rarely has a fire been caused by an “act of God” for which the stage has not been set by a careless act or a bit of thoughtlessness.

The minute the United States entered this war, the average farmer became more or less public property. It became his patriotic duty to stay on the job every possible hour to produce a maximum supply of food for his fellow men. His job will be more difficult and more hazardous this year than ever before. He can no longer obtain an adequate supply of repair parts for his machinery, he must work longer hours, and his hired help will be enlisted largely from the ranks of women, children, and retired farmers. All of these problems increase the possibility of accidents, both to the farmer and to his hired labor.

The problem of bringing about any material reduction in the number of farm accidents is so large that all possible support must be enlisted and advantageously employed. Industry has already shown the way by proving that accidents can be prevented,



A broken ladder round; another casualty on the farm front.

and that it pays in actual dollars and cents to concentrate on a good safety program. This accident prevention and safety work in industry has become well established, and is operating according to definite safety codes and practices. It is now necessary to revise these codes so that their provisions will suitably apply to all agricultural endeavors.

Agricultural workers as a general rule are conscious of the fact that they are working in a field that is filled with hazards. Still, they are prone to take a chance either to save time, or because the proper equipment for the job is not available. To overcome this attitude, it is necessary to instill a "safety consciousness" in the minds of all workers, so that they are constantly mindful of their own safety and the safety of their fellow workers. In industry this consciousness has been successfully developed by means of safety meetings, safety training courses and the enforcement of specific safety codes. This plan is not practical for agriculture. After all, a farmer is his own boss, a fact which grants him the right to remove a machinery safety guard, or use a defective ladder to paint his barn if he so insists. There is no trained foreman at his elbow to point out the accident hazards, no safety director to fire him should he needlessly take chances and continually ignore the regulations that have been established for his protection.

Of the several ways available to carry the seriousness of the situation to the agricultural worker, undoubtedly actual personal contact with the farmer will produce the most satisfactory results. Constant repetition is the basis of all accident-prevention training, so the more times the farmer is cautioned to be careful the greater is the likelihood that any campaign will succeed. Group meetings of farmers, assembled for whatever purpose, offer an unusual opportunity to spend a few minutes on the subject of safety. Also, the many persons who daily contact the farmer might include a few words on accident prevention in their conversation. Rural newspapers, magazines, and the radio should not be overlooked as avenues of approach.

As with charity, safety begins at home. There is no better way of introducing the subject of accident prevention in the family circle than by having it carried home from school by the children. The farm youths of today are the agricultural workers of tomorrow. The spirit of safety planted in their open minds today surely will grow into a safety consciousness that will help to reduce the farm accident toll of tomorrow. What parent would not be impressed if his child cautioned him to be careful and not take a needless chance? In our effort to bring up children to be good citizens, we might well remember that to



Better to be safe than sorry; don't trust a bull, no matter how seemingly gentle.

be a good citizen one must protect not only himself but others by being a safe worker.

Farm equipment and machinery manufacturers are doing their part. In the past few years more guards and safety appliances have appeared on farm machinery. Tags, decalcomanias, and bold-type printing in the instruction books caution the user to make certain that safety appliances are in place and in operating condition. Notwithstanding all these precautions, it is still difficult to pick up a rural newspaper and not read that an agricultural worker has been crippled or seriously injured while operating a piece of farm equipment. Regardless of how many safety devices are included on any machine, common sense and an intelligent regard for lurking danger is still the operator's best protection.

Realizing that definite action was needed to reduce the high farm accident rate, the Secretary of Agriculture on November 21, 1942, authorized the Soil Conservation Service, along with other Department agencies, to inaugurate a farm safety program. The objective was to enlist every agricultural worker in the United States in an immediate farm accident prevention campaign.

The interest shown by Soil Conservation Service employees in this new venture in accident prevention work was immediately apparent. They realized at once that *the conservation of soil and water fundamentally depends on the conservation of life and limb*. The intensive employee safety program and the vast number of direct daily farmer contacts placed

Soil Conservation Service employees in an opportune position to make a valuable contribution to a vital wartime need. For seven years accident prevention and safety have been an important phase of the Service employee-training program. The results are seen in an enviable safety record—a record which is steadily improving year by year. This in-Service training instilled a “safety consciousness” in the minds of employees which well prepared them to carry the safety message out to the farms themselves.

Early in the campaign it was realized that the safety doctrine requires considerable diplomacy in its advancement. No person likes to be told that his farm is an accident trap because of his own shortcomings. To avoid misunderstandings, a training course in farm accident hazards and their correction was inaugurated as a part of the regular employee safety program. This course prepares the employee to make sound, practical recommendations which will save life and limb as the farmer and his family go about their daily tasks—points out simple repairs in ladders and equipment, removal of ob-

stacles, the right care and handling of equipment, the prevention of fires, and so on.

Soil conservation district supervisors are also giving valiant support to safety measures. These leading farmers in their own communities, knowing at first hand the alarming toll which accidents have taken among their neighbors, have shown real anxiety to organize and carry on an active farm safety program.

The problem is large enough to command the best efforts of all—city workers as well as those engaged in agriculture. The sabotage of the country's food production job is at stake. Farm accidents are hidden but immensely important factors in the much-discussed farm labor and national manpower situations.

The National Safety Council, which has carried an impressive responsibility in the marked reduction in industrial accidents, has now placed its experience, prestige and facilities behind the farm safety program. Other organizations are following suit. If the accident saboteur is to be suppressed, we must all strike hard and without delay.

SOIL CONSERVATION CAN HELP

(Continued from page 270)

gross volume. In this paper so far I have been attempting to translate soil fertility into the needs of human nutrition. I have pointed out the growth materials of protein, and minerals, as well as the energy-producing materials of sugars, starches and carbohydrates; and I have noted that some of the elements found in the minutest traces in the soil have important functions in the regulatory mechanisms of the human body. *Good nutrition comes from good foods raised on good soil, but these foods must be properly digested and assimilated. In the process of assimilation vitamins stand out as of unusual importance.* Most vitamins are manufactured in plants for themselves, and are then eaten, absorbed and carried by the blood stream to the organs that need them. The animal organism does not have special storage facilities for vitamins. Without vitamins we cannot live. With a shortage of vitamins we only half live. This again places the emphasis upon the fact that we must use our land—invoking every conservation strategy—for the purpose of getting food rich in vitamins.

We must have a clear conception of what a vitamin is. A vitamin simply helps us to use our foods. Therefore, our vitamins should come in fruits, vegetables, milk, eggs, and meat, and not from the drug-

store. Vitamins in pill and drop form are for the physician to give to sick people. Well persons should get their vitamins in each morsel of food they eat. Vitamins are not food. They do not furnish energy and are not utilized as building units for the structure of the body, but they are essential for the transformation of energy and for the regulation of the metabolism of the structural units. This is not the place to go into their nature except to point out that they are widely distributed throughout plant life and that animals are dependent upon plants for them with the exception of Vitamin D which can best be obtained from sunshine. The richer the soils, the better vitamin content have the plants grown thereon. Sometimes a mineral deficiency results in a partial deficiency of these essential substances. We know that small amounts of boron added to certain apple orchards will increase the Vitamin A content of the apples; that the use of very minute quantities of manganese may triple the Vitamin C content of tomatoes; and that liming may also increase vitamin content. The point of all this seems to be confirmation of the age-old axiom that *good soil produces good crops.*

We must be mindful of this in the present emer-
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DISTRICTS INVOKE DRAINAGE TO INCREASE CROP-GROWING AREA

By RAY W. CARPENTER

DRAINAGE is a "must" job in wartime food production in Maryland. The crops which Maryland farmers are being asked to produce in larger quantities are principally the clean-cultivated ones that encourage the spread of erosion if grown on rolling or hilly land. Inasmuch as most of the State's well-drained land suitable for crops is already used for that purpose, any attempt to increase plantings should be made on the more level lands. Here drainage work must be undertaken before peak production can be attained.

FORTUNATELY, a drainage program is already well under way in Maryland. The State is fortunate, too, in having on its statute books two laws which encourage drainage enterprises. The first of these is a soil conservation districts law which enables farmers to organize and direct local land use programs of permanent value. The second is the Drainage Law of 1941 which not only modernizes the old Maryland tax ditch law of 1844 but also complements the soil conservation districts act so effectively that there are now very few drainage problems in the State that will not yield to an economical solution through united group action. How these two laws work can best be told by outlining the development of Maryland's present drainage program during the past 7 years.

Wet land has always been a problem to Maryland farmers, particularly to those on the Eastern Shore, who sought to utilize land that seemed to possess all sorts of agricultural advantages except adequate drainage. Although the original Maryland "tax ditch" law was not enacted until 1844, tax ditches were organized by special acts of the legislature as early as 1826. In 1840 the legislature passed an act entitled "An Act for Clearing out of the Pocomoke River in Worcester County by Means of a Lottery." Under this law about \$28,000 was spent to improve the drainage of the Pocomoke River by clearing fallen trees and logs from the channel. Most of the work was done by hand labor paid at the rate of 75 cents to a dollar per day.

When the "tax ditch" law was passed in 1844, farmers in other sections were able to organize local associations for the construction of community drainage systems of benefit to groups of individual landowners. Such tax ditch organizations possessed the power to levy assessments to compel each landowner

to pay his fair share of the cost of the improvements; furthermore, they possessed certain rights of eminent domain, although the law was never fully interpreted in this respect.

Many drainage systems were constructed on the Eastern Shore following the passage of this law and a similar one in Delaware. These included feeder ditches serving individual farms, as well as main ditches. As long as cheap labor was plentiful the tax ditch organizations prospered but by the turn of the present century they had fallen on evil days. They were not large enough to enable the purchase of labor-saving equipment such as draglines. Some of the defects of the early drainage law became apparent, especially the absence of any effective provision for the collection of assessments for maintenance. Gradually, the tax ditch associations became inactive because they were not so designed as to keep abreast of changing developments. There was no room for a broad, vigorous program of land use.

The Pocomoke River is a good example of the decay of Eastern Shore drainage systems. Despite all the time and money lavished to keep it functioning effectively, it had deteriorated so badly by the early 1900's that much farmland which it was supposed to drain had reverted to woods and idle land. Formerly, this land was considered to be as productive as any on the lower Eastern Shore. Even today, much farmland still in cultivation in this area is subject to danger of partial or total loss of crops if heavy rains occur at any time during the growing season. The 200-day growing season is often shortened as much as 40 days because of inadequate drainage.

In 1935 came a CCC drainage program to Maryland and Delaware—the first active program to meet the situation. The work was under jurisdiction of the former Bureau of Agricultural Engineering of the United States Department of Agriculture and much of the direction of the projects was furnished by the agricultural engineering department of the

EDITOR'S NOTE.—Mr. Carpenter is head of the agricultural engineering department of the University of Maryland and from 1936 to 1939 served as district engineer for Maryland and Delaware in charge of CCC drainage projects conducted by the former Bureau of Agricultural Engineering, U. S. Department of Agriculture.

University of Maryland. Because regulations did not permit use of camp labor for drainage work on individual farms, all work was undertaken in co-operation with existing tax ditch associations and only main or outlet ditches were rejuvenated and rebuilt.

By July 1939 CCC enrollees from three drainage camps had cleared and constructed 250 miles of ditches, improving drainage conditions on nearly a quarter-million acres of land in Queen Annes, Caroline, Dorchester, and Somerset Counties. In Delaware, two camps located in Kent and Sussex Counties did a comparable job.

As benefits from the work became apparent, several of the counties concerned began appropriating county money for the purchase of dragline excavators. They also hired additional skilled operators. Public interest in Worcester and Wicomico Counties was spurred and soon local farm leaders were demanding a CCC camp to aid in improving the drainage conditions in the Pocomoke River watershed. After the State of Maryland had appropriated \$30,000 and the two counties \$10,000 apiece for the purchase of drainage equipment and supplies and for the hire of operators, a camp was established in 1939.

The second phase of the development of the present-day drainage program on the Eastern Shore began when jurisdiction of the CCC drainage camps was transferred to the Soil Conservation Service in 1939. Several new and fundamental contributions to the drainage program were made. First, the Service brought to the project techniques which simplified the maintenance problem. It also contributed research and demonstrations on how to develop grasses best suited to stabilize ditch banks. Finally, it made available additional engineering supervision and equipment.

Notwithstanding this added impetus, it became apparent early in 1941 that the drainage plans would have to be revised. The outlook was not bright for continuance of CCC help because of war and industrial conditions. If the camps were to be withdrawn, no agency would be left to direct and supervise the program. Nearly all of the equipment belonged to the CCC. Furthermore, CCC activities were limited to existing public or main outlet ditches, although there was strong need for assistance with the problems of drainage on individual farms.

Farmers, county commissioners, engineers, and others who looked into the matter agreed that the most logical solution would be the formation of soil conservation districts under the terms of the districts law passed by the State legislature in 1937. The soil conservation district type of organization

was seen as offering numerous advantages, among them the following:

1. It offers a better chance for a permanent and flexible land use program.
2. It commands more attention of the agronomic, forestry, and wildlife aspects of drainage.
3. It makes available assistance on drainage problems of individual farms.
4. It provides an administrative set-up in a position to encourage a ditch maintenance program.
5. It assures an increase in local participation and responsibility in the district drainage program.
6. It is a means of getting Federal assistance in the form of technical help and equipment.

By 1940, public interest in drainage on the Eastern Shore became so great that the University of Maryland hired a full-time extension drainage engineer. He joined county agents and local farm people in recommending formation of districts to insure a continuing drainage program. They did not have to wait long for results. Soon farmers organized districts in Queen Annes, Caroline, Dorchester, Wicomico, and Worcester Counties. At the request of the district supervisors, Soil Conservation Service technicians and the Extension drainage engineer helped write plans and work out programs for drainage operations. After these operations got under way the Extension engineer spent much of his time in the districts in cooperation with district supervisors and Service personnel in putting the plans into action.

The third and present phase in the development of Maryland's drainage program finds these five districts actively engaged in drainage operations. Among other activities, five draglines are at work on public outlet ditches. Two of them are county-owned and one is State-owned. Four of the operators' salaries are paid by county appropriations.

In addition there are a number of tractor and blade outfits engaged in drainage operations on individual farms, with maintenance and operator costs paid by the districts. Several tractor outfits are at work leveling spoil banks. Here, too, costs are assumed by the districts.

This program has been stimulated by the new Maryland drainage law of 1941. A brief outline of this law's salient features might not be amiss. First, a local drainage association such as can be formed under the terms of the drainage law, can directly assess farmers for benefits received. A district cannot do this, but it is a very important prerequisite.

The drainage association can also levy taxes for ditch maintenance. Taxes for construction and maintenance are collected by the county treasurer the same way as other taxes. Many of the old tax



1. Drainage glimpse on property of John G. Rayne, Wicomico County (Pocomoke River), showing original channel at point where it enters new channel; distance water has to drop from old channel to new one can be noted. 2. Along the Black Dam Ditch, on properties of William Bunting and Willis Payne, Worcester County; original stream after clearing and blasting and just before excavation. 3. Section of new channel after excavation, property of Burbage heirs, Pocomoke River, Worcester County. 4. Love grass responded readily to seeding on the banks of Beetree Ditch where it flows through the properties of J. M. Marion and Clifton Walls in Caroline County. 5. A ditch where it flows through the Blackwater Game Refuge is edged by rush and sage marsh; the number of muskrats taken off the area served by this ditch rose from 30 to 137 after ditching.

ditches are being reorganized to avail themselves of this provision.

The drainage associations are specifically authorized to enter into agreements with county, State and Federal agencies in furtherance of their projects.

There are other advantages in the new drainage law but these seem to represent the main points of interest. Maryland farmers welcome the advantages offered by both the soil conservation districts and the "tax ditch" drainage associations. District

supervisors work closely with tax ditch associations on finances, equipment and the hiring of labor, and in many instances have stimulated the organization of local drainage associations for specific drainage jobs.

With a set-up like this, it is natural that the district program in Maryland should be forging ahead in high gear. Maryland farmers have found a good way to increase their supply of crop-growing land, and they are making use of it.

BETTER MANAGEMENT BRINGS BACK THE RANGES

And Provides More Meat for Larders of United Nations

By E. A. JOHNSON

PROPER MANAGEMENT helps to keep good ranges good, and makes run-down ranges better. With armies marching on their stomachs, and beef a veritable munition of war, the good grasses of the rolling West yield vast dividends to intelligence and care. Stocking of ranges according to available forage increases the output of livestock on the range and adds to the meat supply for our armed forces, our allies, and civilian consumption. The resting of depleted ranges gives the grasses a chance to recover. The rotation of pastures, and the avoidance of too-early grazing, helps to fit the ranges for the fight they are being asked to wage.

I

One of the distinctive marks of an improving range is the dying of the poorer plants and their replacement by better ones. There is ample evidence in the general experience of successful ranching. A small part of the information available on this subject, recently submitted by region 6, indicates in a striking manner the improvement in vegetative cover that can be brought about in a few years by practicing good range conservation.

The semiarid climate prevailing in this region—New Mexico, Utah, Colorado, and Arizona—is comparatively unfavorable for luxuriant plant growth and rapid range recovery. Notwithstanding the limited and uncertain rainfall, and the further handicap of an overgrazed and eroded condition at the start, there are numerous examples of the crowding out of inferior forage plants by better ones—effective demonstrations of the restoration that can be accomplished if ranges are given full opportunity to recover under proper grazing use.

This is true not only in the Southwest but also in areas where climatic and physical land conditions are more favorable.

II

IMPROVED CONDITIONS ON ELENA GALLEGOS GRANT

THE ELENA GALLEGOS GRANT, a range area of several thousand acres in New Mexico, was placed under cooperative agreement with the Soil Conservation Service in December 1937—long be-

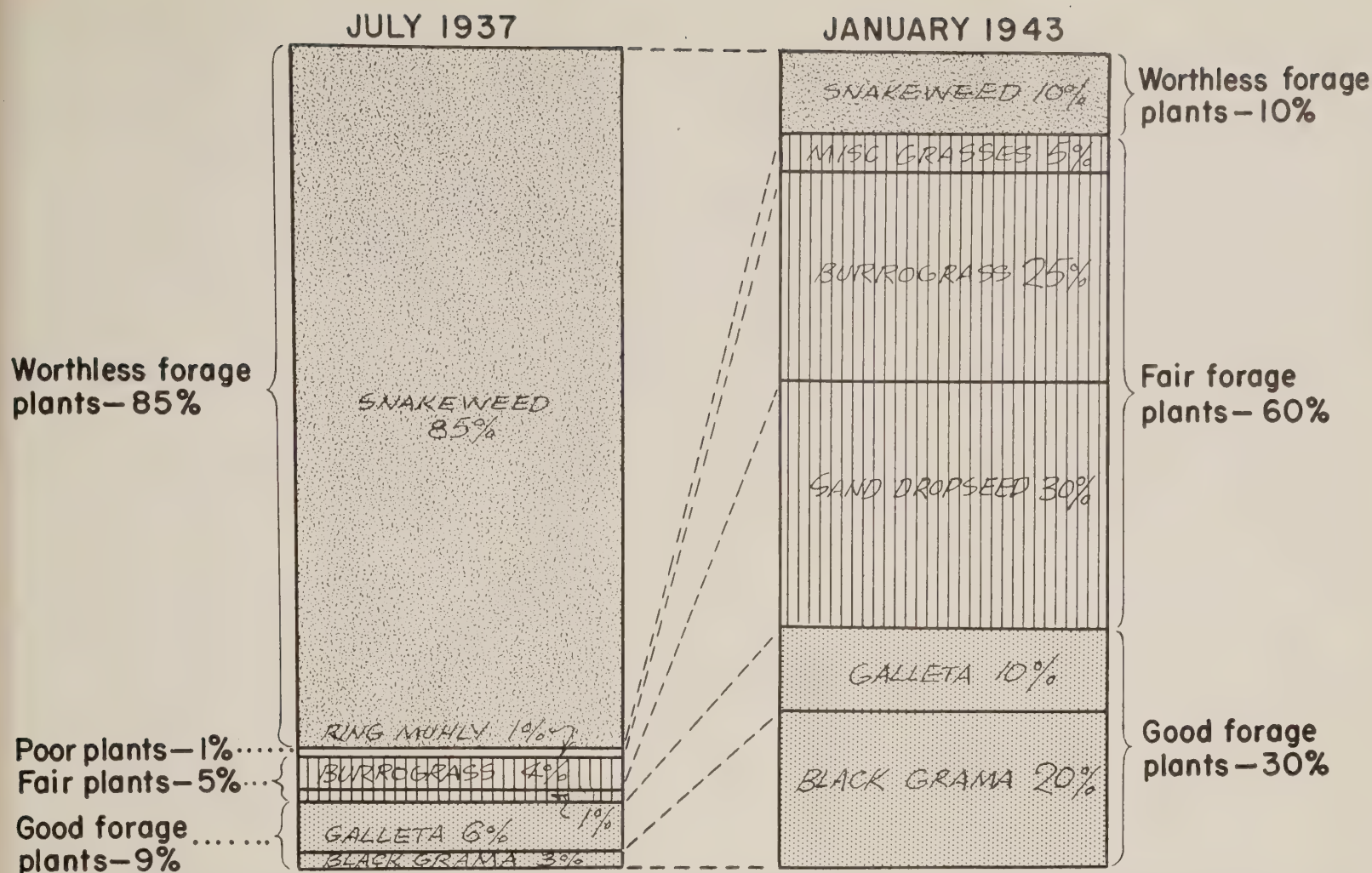
fore the exigencies of war made peremptory a vast increase in the marketing of livestock. A range survey during the preceding summer revealed that the area had been heavily over-used by cattle and sheep for many years. As a result, the good forage plants originally on the range had been reduced in vigor and density. Many had died and had been replaced by undesirable or worthless plants, principally snakeweed. The range was producing only a fraction of its potential yield of forage and livestock products. Black grama, one of the better forage plants typical of this part of the country, made up less than 10 per cent of the total vegetative cover. Other plants such as sand dropseed and burrograss, normally abundant in this area, composed only 7 per cent and 4 percent, respectively, of the plant composition. Only 5 percent of the ground surface was covered with vegetation. The transition wrought in a brief span of years is clearly indicated in the chart accompanying this article.

During 1937 and until the summer of 1938 the area was used to an unlimited degree by livestock from adjacent farms in the Rio Grande Valley. The grant was fenced in the summer of 1938. No grazing was allowed until the middle of October 1940, to give the more desirable types of vegetation an opportunity to regain vigor, to produce seed, and to build up a growing reserve. Thereafter the grazing was regulated in accordance with approved range-conservation principles, mainly proper stocking involving the use of specific numbers and kinds of animals.

During the fall and winter of 1940 only light grazing use amounting to 51 animal unit months was allowed. In 1941 this was increased to 161 animal unit months, and in 1942 to 479 animal unit months.

In addition to proper management, some water-spreading diversion and contour furrowing were

EDITOR'S NOTE.—The author is assistant chief, Range Division, Soil Conservation Service, Washington, D. C. Acknowledgment is extended to J. L. Lantow, A. R. Swanson, and Don Hubbell of region 6 who contributed data on which this article is based.



Portrayal of forage improvement through proper range management on a portion of the Elena Gallegos Grant, New Mexico, over 5½-year period.

done. Water-spreading undoubtedly aided in range recovery on the areas treated, but little if any improvement resulted from the contour furrowing. The recovery of the range as a whole may be ascribed mainly to improved management.

Marked improvement has occurred in the 5½ years from July 1937 to January 1943 in both the amount of vegetation on the ground and the kind and quality of plants making up the vegetative cover. On pasture No. 1, a tract of nearly 3,000 acres, the results achieved under the range conservation program may be summarized as follows:

1. An increase in the average density of vegetation from 5/100 to nearly 8/100, or a gain of 52 percent. Some areas show an increase of as much as 80 percent.

2. An average increase of 76 percent in the proportion of black grama in the composition, with some localities evidencing nearly 6 or 7 times as much of this valuable grass in the composition in 1943 as in 1937.

3. An average increase of 550 percent in the proportion of sand dropseed in the composition, with some localities showing as much as 30 times as much of this grass in the relative abundance of species as the range showed in 1937. Future years may show

a slowing up in the rate of increase of this species as the more valuable species take their place in the vegetative picture.

4. Introduction of the valuable blue grama in some localities, and disappearance of poor species like three-awn, ring muhly, and fluffgrass in others, although in some instances these inferior species have come in as a natural, although temporary, component of the vegetation representative of the current stage in the process of plant succession.

5. An average decrease in the proportion of snake-weed in the total composition from 74 percent to 9 percent, amounting to almost complete disappearance in some areas.

6. An increase in the forage value of the pasture as a whole amounting to nearly 3½ times the forage value at the time the range conservation program was initiated. With steady improvement in soil and vegetative conditions under conservative stocking, the grazing capacity may be expected to increase still further until it reaches a maximum point which, in average years, will permit full use of the forage produced without impairing the value of the forage cover for soil protection, erosion control, and maintenance of soil fertility.

RANGE IMPROVEMENT ON THE ESPIRITU SANTO GRANT

ON THE ESPIRITU SANTO GRANT, an area of about 120,000 acres in north central New Mexico administered by the Soil Conservation Service as a land utilization project, the valuable grasses similarly are reestablishing themselves. Although some mechanical treatment in the form of diversions, water-spreading, contour furrowing, and gully control had been applied, the rehabilitation has been due in large measure to good range management, particularly proper stocking.

Prior to purchase of the grant by the government in 1935, the range was grazed by large numbers of livestock. It is known that it was heavily stocked with cattle during the cattle boom of the eighties. During the period 1920 to 1937 the average use of the area was about 8,000 sheep throughout the year, which was almost double the estimated grazing capacity at the time the range conservation program was instituted. The heaviest use for which records are available occurred between the years 1929 to 1934 when 12,000 head of sheep were grazed throughout

the year. In addition, several hundred head of horses and other livestock were known to have used the area.

The boundary fence was completed in 1936 and all unauthorized livestock were removed at that time. Since then the area has been stocked by both sheep and cattle as follows:

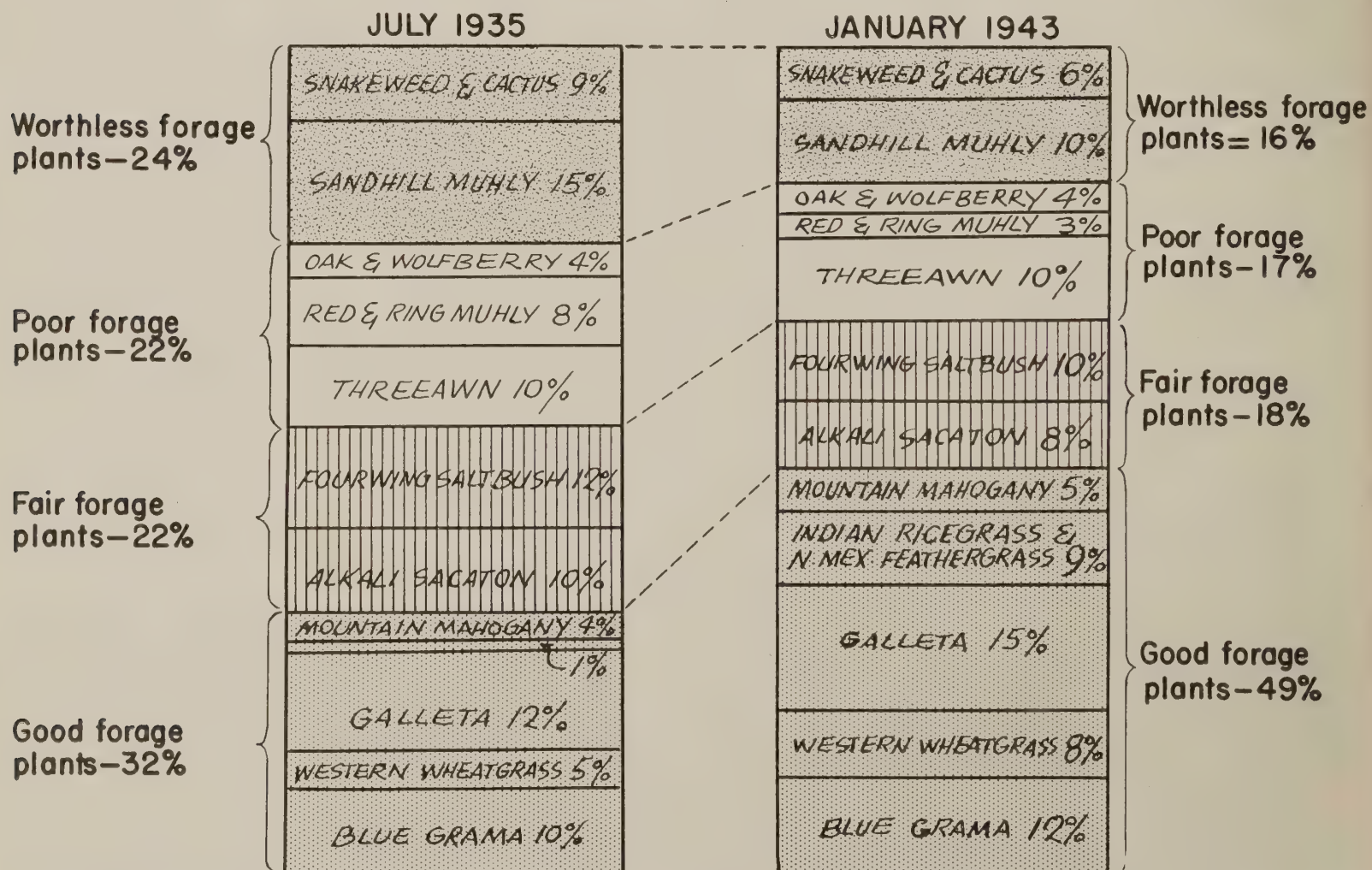
July 1, 1936, to June 30, 1940—805 animal units yearlong.

July 1, 1940, to June 30, 1941—870 animal units yearlong.

July 1, 1941, to June 30, 1942—1,010 animal units yearlong.

July 1, 1942, to June 30, 1943—878 animal units yearlong (authorized).

Improvement in vegetative conditions as determined by forage inventories made in July 1935 and again in January 1943 includes increase in the amount of ground surface covered by vegetation as well as changes in the kind and quality of plants making up the vegetative cover, as reflected in the second of the two charts accompanying this article. On the basis of studies made on representative portions of the range the density of ground cover on the area as a whole has increased about 15 percent in this



Portrayal of forage improvement through proper range management on a portion of the Espiritu Santo Grant, New Mexico, over 7½-year period.

7½-year period. The proportion of grasses, mostly valuable species, has increased in some places as much as 15 percent, and certain ones like western wheatgrass have tripled in abundance. Other desirable species showing increases are blue grama, galleta, and Indian ricegrass. On the other hand, such inferior plants as snakeweed, Russian thistle, cactus, tumblegrass, and other poor species showed a marked decrease in practically all areas and in some places has disappeared altogether.

Other substantial improvements have been made as well. Many of the formerly actively eroding gullies now have a vigorous growth of palatable grasses and are healing satisfactorily. There are numerous instances of a notable decrease in the amount of run-off water.

IV

WESTERN WHEATGRASS IN NEW MEXICO

AT THE NAVAJO EXPERIMENT STATION in northwestern New Mexico studies on the effect of various conservation practices on vegetation, soil, moisture supply, and their interrelationships have been in progress since 1935.

An outstanding instance of replacement of inferior plants by valuable forage plants is the remarkable recovery of western wheatgrass on a portion of the range included in this station. This grass, as the result of water-spreading, together with control of grazing, invaded many of the heavily silted areas. Originally making up only 1 percent of the total grass cover in 1935, western wheatgrass increased until in 1941 it made up 10 percent of the total.

Although the total amount of all vegetative cover on the ground decreased, due primarily to siltation, the total density of western wheatgrass increased about 4½ times, and in some localities nearly 60 times. In other places this valuable grass came in where there had been none before.



Dense stand of western wheatgrass growing in nearly 15 inches of sediment. It is now the dominant grass, having replaced red threeawn and other less desirable plants on areas where soil moisture conditions have been improved by water-spreading.



Here in these two pictures is an example of the effect of good range management on both forage and soil under the semiarid conditions prevailing in southwestern New Mexico. Above, 1938, is a depleted, heavily grazed stand of vegetation incapable of holding the soil. Below, 1940, the head erosion has been checked, the gully bottom is rapidly filling with vegetation, the plant cover on adjacent land has thickened considerably; the better forage plants have regained their vigor and the range as a whole is being restored to high productivity.



Some of the poorer species declined, especially annual forbs which generally decreased in abundance wherever the grasses markedly increased. Species replaced include such inferior plants as red three-awn, Russian thistle, and Watson's goosefoot.

It is significant that, notwithstanding the over-all reduction in total density of grasses, the total production of forage increased fourfold to tenfold due to increased height and volume growth.

V

NOT OVERNIGHT can the worn ranges of the Southwest provide a maximum meat output for the larders of the United Nations. They must be re-grassed, and better grassed, and that takes more than a single season. But the war may be long, and post-

war needs will be great. Already fine progress has been made, is being made, and will continue to be made. The good grasses are coming back by sound management practices based on experience and research.

The farmer or rancher who desires to get the most out of his native range consistently, year after year, should observe carefully what is happening to the various kinds of plants, especially whether the better forage plants are increasing or decreasing in abundance and spread. A record of the better kinds

of plants on a sample portion of the range will show how much the more valuable forage plants are increasing as the range improves. The amount of ground covered by all vegetation may also increase, especially if the range was badly run-down to start with. Such records show the progress of range improvement, and when combined with weather information and an analysis of how closely the better plants were utilized, furnish a basis for making the adjustments in grazing that are necessary for production of both forage and livestock on a high level.

CONSERVATION COMES TO THE SHARP SLOPES OF PUERTO RICO

BY LOUIS F. THOMANN¹

THERE'S A TROPICAL outdoor laboratory down in Puerto Rico where the studies under way on conservation farming affect millions of lives. But of even greater significance than the domestic benefits, this research work is of vital importance to the United Nations as it bears on production of such crops as sugar, cotton, coffee, citrus fruits, fresh vegetables, and pasture grasses.

OBSERVATIONS made by the Soil Conservation Service at the Mayaguez Experiment Station since 1937 are more than mere recordings of the effects of torrential rains beating upon the steep slopes of lateritic soil. Designed to ascertain the causes and effects of run-off and soil erosion, and to develop measures of control, the project also has delved into cultural methods and terrain reformation. Through these studies, the farmers of the island are learning to save soil, make the best use of intense rainstorms, and provide a better standard of living for their families.

Conditions of soil and climate at the experiment station are common to all of the tropics, and especially the Antilles. Slopes of the Cialitos, Catalina, and Mucara soil types vary from 10 to 60 percent. Annual rainfall averages 82 inches with monthly variations from 2 to 11 inches. There is run-off of water from about 90 percent of the rainfall with a wide difference between seasons. Run-off occurs on a total of less than 10 days during the dry winter months of December, January, and February; however, there is run-off on about one out of every three days in the wet months of May through September.

Although variability in rain intensity was found an important factor in causing variations in rates of run-off and erosion, vegetative and soil conditions tended to counteract and minimize the effects of increased intensity. Evidence from 374 farms showed



Tank crew weighing run-off after a 3.30-inch rain at the Mayaguez research station.

that grass-covered plots lost much less soil than bare plots. There was an average annual soil loss of 2,321 pounds per acre in Guinea grass, as compared with a loss of 382,151 pounds of soil from a desurfaced acre.

Difference between the run-offs from two methods of planting sugarcane was slight, but the rates of erosion on plots planted in holes was significantly greater than the erosion on plots planted on the sides of contour furrows. The furrows acted as settling basins and, too, there was a more even distribution of stalks across the contoured rows to check soil loss further.

¹ Current Information Section, Soil Conservation Service, Washington, D. C.

Two cultural methods of growing coffee shaded by bananas were compared for relative amounts of run-off and erosion. An older method, a "ground skinning" or "pica tierra" process, consisted of cutting all grass and weeds closer than 2 inches to the surface of the ground prior to coffee harvesting and at two other times during the year. By the newer method, the grass was permitted to grow uncut except for a bare ring 1 foot in radius about the coffee plant. Each plot was one-fiftieth of an acre in size, each had a similar density of overhead canopy formed by banana and other trees, and each had an average slope of 61 percent.

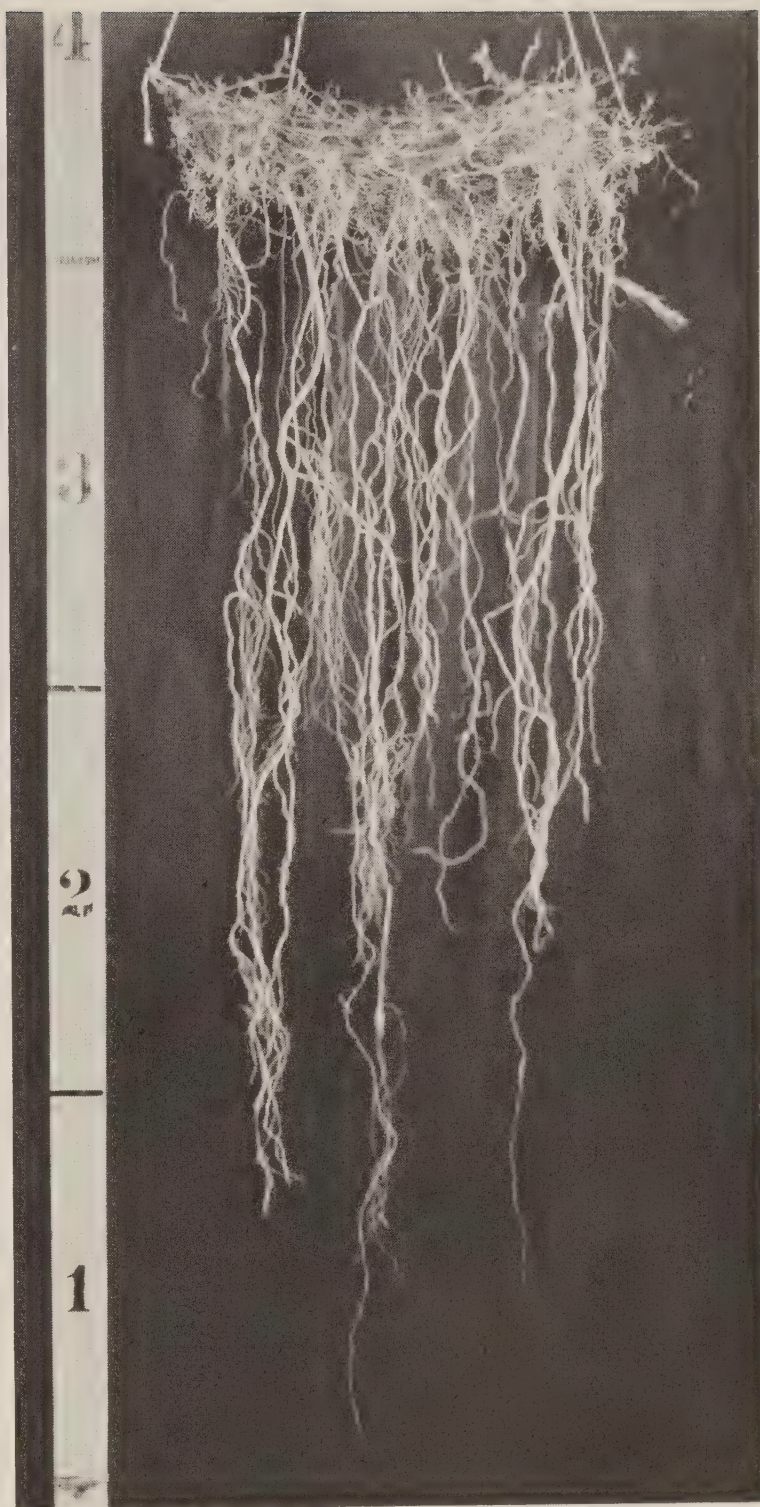
Results indicated that increases in rainfall intensities were, as usual, associated with increases in rates of erosion and proportion of rain which ran off from both plots. Studies of 115 rains definitely showed that the method of "ground skinning" the soil surface of grass and weeds 3 times a year was from 2 to 10 times as wasteful of soil and water as the method wherein the grass was cut only within a foot of the coffee plants.

These experiments with sugarcane and coffee plants are of extreme importance to the agricultural economy of the tropics and of special significance to millions of ration-minded Americans in the United States.

A study was made of 155 rains upon four nonvegetated plots, two of Catalina subsoil and two of Catalina topsoil, to determine relative effects of several variables upon the rates of run-off and erosion. The results showed that for a given amount of rainfall under these conditions the amount lost as run-off depends largely upon the variations in degree of slope, in the amount of organic matter present in the soil and in the amount of moisture in the soil before the rain. On the other hand, the survey indicated that differences in soil porosity, specific gravity, percent of clay and finer material and certain indexes of susceptibility to washing were not related to differences in rates of either run-off or erosion.

Another study showed that variations in rainfall intensities and soil moisture before rains accounted to a large degree for the variation in the rate of run-off from two Guinea-grassed plots. Here, too, variations in the specific gravity of the soil, in soil porosity and in the duration of rains, as well as influences of overhead canopy and of total rainfall per rain, were shown to be of doubtful importance in explaining the variability in run-off. Variations in the organic content and the slope gradients of Guinea-grassed plots were not great enough to be considered in the calculations.

Greatest effect upon variation in rates of erosion from the grassed plots resulted from differences in



The nodule-bearing trailing indigo has a useful job to do in Puerto Rico. These long roots, a 2-year growth in Mucara clay, indicate drought resistance.

rates of run-off, and of slightly less consequence was variation in overhead canopy. However, there was no significant effect upon rate of erosion due to variation in duration or intensity of rains, moisture content of the soil before the rains, specific gravity of the soil or soil porosity. Effect of variability of total rainfall per rain upon erosion rates also was of doubtful importance.

Major objectives of experiments with grass and legume mixtures on the research station plots have been to determine which species will increase density and herbage production in order to reduce soil ero-



A 14-month-old pasture of molasses grass on a farm near Mayaguez—slope, 30 to 45 percent; small areas were fenced off, fertilizer and spot seeding employed, contour furrows used.

sion and cut feed costs. Trailing indigo gave excellent results in mixed planting with other species, with the exception of Para grass and wandering jew. A mixture of trailing indigo and Barbados sourgrass apparently is well adapted for dry areas of Puerto Rico since both are drought-resistant.

Trailing indigo proved better than wild grasses as a soil binder below stiff-stemmed grass barriers on banks of bench terraces constructed by normal plowings, although it was shown to be inferior to centipede grass, African digitaria grass and molasses grass as a soil binder. Yielding up to nine tons of green matter a year, trailing indigo compared favorably with several species, including molasses grass, Cogon grass and Manilla grass, from the standpoint of high forage productivity and usefulness in soil erosion control.

Results of study at Mayaguez to date show that pasture grasses have required nitrogen fertilization and that highest yields were secured when a nitrogen-phosphate-lime combination was used. However, the observations are being continued over a longer period of time to obtain more conclusive data on this phase of the pastures project.

Experiments have been carried out on the formation of bench terraces on 20 to 45 percent slopes. It has been found that 80 percent of the earth movement can be accomplished by normal plowings for field crops if a 4½- to 5-foot vertical interval is used between stiff-stemmed plant barriers. Of 5 plants tested for this barrier use, elephant grass ranked best and was followed in order of rank by

Guatemala grass, sugarcane, sorghum and bamboo. Terrace banks 2 feet high were formed in 2 years by making 8 plowings causing fill above the terrace and 4 plowings producing cut below the bank. Banks, nearly 3 feet high, were produced in 2 years by 4 plowings above the barrier and by 12 plowings below the barrier line.

Based upon observations at Mayaguez, a bench-terraced acre of lemon grass should produce more than 50 pounds of oil each year. If distilleries for processing the oil were started on the island, it is anticipated that the grower's 40 percent of the oil would return him an annual gross profit ranging up to as high as \$70 per acre.

Experiments with soybeans also have been carried out on the research plots. Of 10 different kinds tested, the Clemson and Creole varieties of this vital war crop produced the highest quality and the greatest quantity of seed.

Primarily a study of water and soil conservation, the research work also has developed information on tropical crops of economic and subsistence value to the people of Puerto Rico and of immediate importance to the United Nations' war effort.

The work of these scientific-minded men in the outdoor laboratory at Mayaguez is basic to a continuing productive agriculture in the tropics. With conservation methods as a solid foundation, the future of farming in our Puerto Rican outpost is brightening, even though it must rely upon more intensive methods than anywhere else under the Stars and Stripes.

SOIL CONSERVATION CAN HELP

(Continued from page 274)

gency. We must put what we know about crop management, fertilizers, and soil conservation to work. Soil conservation has a lot to do, not only in increasing yields, both in quantity and quality, but also in feeding the soil through proper rotation, drainage and irrigation, aeration, and the restoration of mineral and organic contents. Streams from our farmlands must once more run clear, and the minerals we sell off the farm must be returned. Soil treatments, including manures, limestone, and fertilizers, are but small additions, yet if properly applied and properly conserved, our land can be made to produce as much or more at the end of this long drain as it did in the beginning. We must see to it that our soil is so treated and so conserved as to supply, no matter how long the war may last, forage that is rich in protein, minerals, and vitamins; so that our meat, milk, eggs, legumes, and cereals shall be rich in all essential factors.

REVIEWS

OUR LANDED HERITAGE—THE PUBLIC DOMAIN, 1776-1936. By Roy M. Robbins, Princeton, 1942.

The conservation movement and the public domain grew up together. For this reason conservationists have an especial interest in "Our Landed Heritage." In it Dr. Robbins has placed in their proper political and economic settings those hangovers from the past that, even today, tend to retard the progress of conservation.

From the beginning of our history, Americans had been prodigal of their land. The supply seemed inexhaustible. By 1802, the Federal Government already possessed 259 million acres ceded to it by the seven original states with claims to western lands. The next year the public domain was quadrupled by the purchase of Louisiana Territory. By the time the country attained its full territorial growth, the Government had acquired in all nearly 2 billion acres of public land through cession, treaty, or purchase.

Until permanent settlement began to penetrate beyond the Mississippi, there was little national concern about conservation. Revenue from the sale of lands, the peopling of the West, and the dangers of land speculation were more immediate problems. Beyond the 100th meridian, the gradual decrease in rainfall from east to west became pronounced. The 160 acres granted by the Preëemption Act of 1841, and by the Homestead Act of 1862, were designed for humid regions and proved inadequate for the semiarid Great Plains, where drought recurred with disconcerting irregularity. To the farmer the Government's offer of land was guarantee enough that farming was both possible and practical. Both assumptions at times proved false. Within a few years after settlement, crops failed, and the soils began to blow. Cattle raising was not profitable on small farms, and irrigation was limited by availability of water. Relief measures followed in rapid succession. These were not actually conservation measures, but rather their forerunners. Because they were not based on scientific knowledge of the land and the actual needs of settlers, relief legislation, like the Timber Culture, the Desert Land, and the Enlarged Homestead Acts, not only failed in its objectives but, in addition, opened new loopholes for speculation.

Each failure was accompanied by increased recognition of the need for conservation. As early as 1878, Maj. John W. Powell recommended the clas-

sification of land according to its best use, the discarding of worn-out land legislation, and the granting of lands in amounts proportionate to the practical needs of settlers. In his inaugural address, President Hayes even went so far as to suggest leasing on the Great Plains and the legalizing of the cattle industry. The National Academy of Sciences recommended scientific surveys of the public domain, the Geologic Survey was established, and the Public Land Commission was created to investigate the land problem. Each proposed reform affected somebody's vested interests adversely—the cattlemen, mining interests, States anxious to develop their resources as rapidly as possible, lumber magnates, or railroads. When the President was granted the right to establish forest reserves, it was condemned as an "extraordinary and dangerous power."

Interest in conservation also ebbed and flowed with sectional rivalry: the North against the South, the industrial East against the agricultural West, public land States against those without land, cattle regions against agricultural. Each faction had a modicum of right on its side but its interests were essentially local and selfish. Finally, in 1908, Theodore Roosevelt called a conference of the State governors largely for the purpose of formulating a uniform public sentiment on problems of conservation. A quarter of a century more elapsed before the passage of Taylor Grazing Act, the closing of the public domain to private entry, and the establishment of the Soil Conservation Service. These three events came almost simultaneously and had as their common goal the conservation of the natural resources of our country.—Reviewed by Lois Olson.

IMPROVING RANGE CONDITIONS FOR WARTIME LIVESTOCK PRODUCTION. Fred G. Renner and Eric A. Johnson, United States Department of Agriculture Farmers' Bulletin No. 1921. December, 1942.

The demands of the armed forces and civilian population both in this country and abroad for an adequate supply of meat products and wool have focused attention on the range lands of the country on which most of the livestock raised in the United States is produced. It has been recognized for years that, by and large, these lands are not producing forage to the extent of their greatest capacity. Both ranchmen and range technicians have recognized that some ranges are more productive than others and that individual ranges can be restored to higher levels of productiveness, but up to this time no generally accepted standards for determining and classifying the condition of ranges have been established.

The authors have drawn from many years' experience in examining and analyzing ranges, from

investigative work in the field of range management, and from the practical experience of farmers and ranchers in the preparation of this bulletin. A method of classifying range condition is described, and the identifying characteristics of ranges in different stages of productivity are presented. The publication also sets forth the principal conservation practices which practical experience has found to be effective in improving range conditions. Conservative stocking, the key to all improvement measures, is stressed. Other time-tested management

practices recommended include the proper seasonal use of ranges, deferred and rotation grazing, consideration of range condition in dividing the range into pastures, distributing salt in unused portions of the range, relieving ranges in poor condition by establishment of properly spaced, adequate and dependable water supplies, use of fences as a means of distributing livestock on the range, use of good herding and bedding methods, and grazing the range with the kind and class of livestock for which the forage and range are best suited.

DEATH OF DR. JAY A. BONSTEEL

WITH THE DEATH OF Dr. J. A. Bonsteel, two days before he was to retire from a long career of public service, the thoughts of those who knew him intimately turned back to the early days of soil survey work in the United States.

At that time—at the dawn of the 20th century—Dr. Bonsteel, Milton Whitney, Clarence Dorsey, G. N. Coffey, W. E. Hearn, Macy H. Lapham, W. T. Carter, and other land specialists were undertaking to bring some order out of the chaos of meaningless terms that characterized our unscientific ways of classifying the soils of the country. This small group originated soil classification and soil surveying in America.

Long before the turn of the century, workable systems for classifying rocks, minerals, chemical elements, plants, and animals had been established; but there was no scientific system of soil classification. Such vague terms as “freestone land,” “limestone soil,” “sandy soil,” “red clay,” “river bottom,” “white-oak land,” “oak hammock,” “bay heads,” “savana,” “pocosin,” “custard apple,” “crawfish land,” “cowhide land,” and many others were in common use throughout the Americas. For the most part, these indefinite terms were not only inadequate but generally misleading, even in the localities where they were most commonly used.

Dr. Bonsteel made an outstanding contribution to the development of soil classification and soil mapping. It was not easy in those early times to persuade people—farmers or scientists—that what we had in the way of soil classification was far short of what the country needed. Often the early surveyors were thrown off farms—bodily sometimes—and turned away from the doorsteps of the too-common type of disinterested laboratory and indoor agricultural technicians. In those days, bulletins dealing with experimental results obtained on a single one of the many soil types of a state were being published and distributed broadcast, without a thought that the information might have a very restricted geographic applicability because of some variation of soil or climate that

easily could have influenced (often did) the outcome of the experiment and, therefore, the applicability.

Bonsteel saw much of the country and profited by what he saw. Not only did he contribute greatly to the establishment of a scientific system of land classification, but he never lost sight of the aspects of utility in connection with soil survey work.

Since those early days, a vast amount of knowledge with respect to soils has been accumulated and, quite naturally, improvements have been made in the techniques of classification and surveying. Other methods of land classifications have had to be developed to meet the needs of those who work with the land. The land capability survey, developed in the Soil Conservation Service, is an example of a new type of survey that had to be developed for the needs of soil conservation work. And Bonsteel has assisted with the development of this new tool for applying soil conservation measures to the land according to its needs and adaptability.

Dr. Bonsteel retired from the Soil Survey in 1920, but was called back to government service in 1935 by the Soil Conservation Service to help with the development of the new science and practice of soil conservation. Again, in this work, his contributions are serving his country well.

In helping with the establishment of a sound soil conservation program on a national scale, Bonsteel's life experience of technical and practical work on the land has come to a highly beneficent fruition; for it turns out that more than anything else a good job of soil conservation—for which he worked so earnestly—gives the greatest returns in the way of increased per-acre yields that now are needed as never before in our history.

These brief words give scarcely a glimpse of the lifework of this worthy man, who did so much for his country; but they come out of the recollections of one who has long worked very closely and understandingly with his good friend, Jay Bonsteel.—
HUGH H. BENNETT.

For REFERENCE

Compiled by **ETTA G. ROGERS, Publications Unit**



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¹ From Superintendent of Documents, U. S. Government Printing Office, Washington, D. C.



The fair serenity that is rural Vermont's is well told in this long look down a country lane. The lacy leafiness of ceiling, the venerable sentinels along the sides, the draft team proud in its high-massed load of hay, the master high-perched on his good bounty—all bespeak the rugged confidence and sound husbandry of liberty-loving New England.

Here is the scene as it ought always to be. Calm, safe, and beautiful. A refuge from the horrors and the hazards and the tensions that beset millions of men, women, and children today.

Unfortunately, as John H. Wetzel observes in his article within these covers, wartime farming is actually one of the most dangerous of all occupations. Accidents take a bigger toll than in industry and become a major factor in the farm-labor situation. He asks the enlistment and cooperation of all of us in an educational campaign to insure greater safety on the farm, pointing out the imperative necessity of better *human conservation*.—THE EDITOR.

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SOIL CONSERVATION

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